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ABSTRACT

The Science in Action series is designed to teach practical science concepts to special-needs students. It is intended to develop students' problem-solving skills by teaching them to observe, record, analyze, conclude, and predict. This document contains a student workbook which deals with basic principles of life science. Seven separate units include: (1) you are alive; (2) moving parts; (3) staying alive; (4) the movers and removers; (5) systems that control your body; (6) creating life; and (7) taking care. The units consist of basic introductory information and questions, worksheets, a self-checking quiz, and instructions for experiments. A cumulative test is provided at the end of the workbook, along with a glossary. The teachers guide (which is included) explains how to use the workbook, together with teaching suggestions and enrichment activities for each unit. (TW)

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Human Systems

Life Science in Action

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Human Systems

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Teacher's Manual

Human Systems

Susan D. Echaore

A Janus **Life Science in Action** Book

Teacher's Manual written by John Bartavian and Susan D. Echaore

OVERVIEW

Living Science

Are science concepts really too difficult for special-needs students to understand? Not when you present those concepts as practical and relevant to everyday life. Then, students no longer find science confusing, but actually fun to learn. We wrote ***Human Systems*** and the other books in the Janus ***Science in Action*** series to help students with learning difficulties learn about science in ways that are meaningful to them.

Human Systems is a workbook that teaches basic concepts about human anatomy and physiology. It uses easy-to-understand language and reinforces the concepts with easy-to-do activities.

In *Human Systems* students learn about ten organ systems that make up their bodies. They learn how the systems work together so they can breathe, eat, move, think, talk, and so on. They also learn what the body needs to stay alive and healthy.

Designed to Teach

Human Systems is specially designed for special-needs students. Each lesson is short (one or two pages), and teaches only one major concept. Concepts are presented in brief, comprehensive chunks so students can easily handle the new ideas. An array of multi-modal activities reinforces the concepts.

Human Systems is part of a set of Janus ***Life Science in Action*** workbooks. (Other Janus sets are ***Physical Science in Action*** and ***Earth Science in Action***.) This workbook can be used as a supplement to or as the core of your science program. It also can help your students meet general and laboratory science requirements.

OBJECTIVES OF THIS WORKBOOK

The Janus *Science in Action* series is designed to teach special-needs students basic and practical science concepts they can apply to daily living. It also helps students develop problem-solving and thinking skills by teaching them to observe, record, analyze, conclude, and predict.

The objectives of *Human Systems* are to help the student:

- learn about ten organ systems: circulatory, digestive, endocrine, excretory, lymphatic, muscular, nervous, reproductive, respiratory, and skeletal;
- learn how each system functions;
- learn how his or her body grows and develops;
- learn some practices that can help him or her maintain a healthy body;
- build a vocabulary of useful words that describe the organ systems and the human body.

READABILITY

Human Systems averages below a 2.5 reading level, according to the revised Spache Readability Formula. Target words—words important to understanding the science concepts—are set in boldface type when they first appear. They are also listed in the book's glossary and under "Teaching the Units" in this manual.

We suggest reviewing each unit's target words with your students before starting that unit. Help them pronounce the words and use the glossary to look up definitions. You can also help reinforce your students' comprehension with vocabulary exercises and word games.

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HOW TO USE THIS WORKBOOK

The Workbook Format

Human Systems is formatted so students can easily recognize what to do on each page. Lessons are taught on one- or two-page spreads, with each lesson followed by an activity.

Units 1 through 6 open with a brief introduction and a set of topic questions to focus students on the concepts they'll be learning. This is followed by "Before You Start," a short vocabulary exercise.

Units 1 through 6 end with "Check Yourself," a short comprehensive exercise; and "Check These Out," a list of multi-modal activities that reinforce and expand the concepts taught in a unit. (Each of your students can successfully handle at least one of these activities.) One ongoing activity is "Science Notebook": Students keep a binder of special activities they complete from unit to unit.

Unit 7 is set up for students to research nutrition and the dangers of abusing tobacco, alcohol, and drugs.

Introducing the Book

Have the students stand up and walk across the room. Then ask them: *What parts of your body let you move?*

After your discussion, pass out *Human Systems.* Read the table of contents out loud to your students. Talk about the organ systems they will be learning about. Then give them time to leaf through the book. Finally, read the introduction out loud.

Introducing the Unit

Post large diagrams or pictures of the organ system students will be learning about. Ask them what they know about that system.

Then read the unit introduction out loud. Discuss the topic questions with your students and have them answer as a group. Write down their answers and put them on the bulletin board. (At the end of the unit, have the students answer the questions again; then compare their answers, so they can see how much they learned.)

Before students do "Before You Start," write the words on the chalkboard. Pronounce each word, ask students what they think it means, then define the word in context for them.

Teaching Suggestions

Successful Learning

Special-needs students can be easily distracted when they work alone on subjects such as science. So, we suggest keeping them together as they work through the book. Pace their learning: Read each lesson out loud and encourage discussion, helping them relate the teaching to their own experiences and past learning. Before students work on an activity, make sure they understand the concepts. Then closely supervise students as they work, helping them reach correct conclusions.

Allow for the individual's skills. Direct your faster students to "Check These Out" or other enrichment activities as you work with slower students.

Be Prepared!

Many special-needs teachers are not trained in teaching science. Some may be just as wary of science as their students. But with preparation and organization, any special-needs teacher can have satisfaction teaching his or her students science.

A bibliography at the end of this manual lists sources offering basic information about the human body. You might also keep reference books in class. We suggest you invite professionals such as doctors and chiropractors, sports trainers and nutritionists, to speak to the class.

Before starting students on a unit, read through it yourself. Answer all questions and do all activities to get an idea of problems that could arise. You'll find out what activities need to be adapted to your students' skills. You'll also be able to note what concepts you'll want to expand on.

End-of-the-Book Exercises

Human Systems ends with "Show What You Learned," a page of two brief comprehensive tests. "What's the Answer?" tests students' comprehension of the organ systems they learned about, and "What's the Word?" tests target vocabulary.

About the Glossary

The glossary at the back of *Human Systems* lists and defines words that appear in boldface type in the book. The words are listed alphabetically and divided into syllables to help students decode. Definitions are deliberately narrow to help your special-needs students understand the concepts taught in this book.

TEACHING THE UNITS

Unit 1: You're Alive!

Target Words: *cell, multiply, organ, tissue*

This unit prepares your students for the more detailed information they will learn as they work through the book. Students are introduced to the cell, the most basic living thing in the world.

PAGE 5: **What's Your Body Made Of?**

Students learn that cells make up every part of the body. They learn that cells make up tissues, tissues make up organs, and cells, tissues, and organs together make up an organ system.

PAGES 6–7: **Close-Up of a Cell**

Materials: *flat toothpick, dropper, water, glass slide, cover slip, methylene blue stain*

Students prepare a slide of their own cheek cells and look at it under a microscope. Then they draw what they see. Demonstrate the activity for your students. Then walk through each step with them as they do it. (To avoid air bubbles, hold the cover slip at a 45-degree angle so it touches the solution before dropping it on the slide.)

Have students first look at the cells under low power; find one cell, then turn the lens to high power and focus it on that cell. You might pin a picture of cheek cells as seen under a microscope on a bulletin board, so students know what to look for.

PAGE 8: **Cells Multiply**

Students learn that a cell divides and multiplies into two cells. You might show students photographs of the different stages of cell division.

PAGE 9: **Close-Up of a Tissue**

Students prepare a slide of raw hamburger and look at it under a microscope. (Students should use only a tiny fragment of hamburger.) Reinforce the idea that they are looking at muscle tissue and that is what muscle tissue from the human body looks like.

PAGE 10: **Check Yourself**

1. (A cell) **c.** is the smallest living thing. **2.** (A tissue is a group) **e.** of the same kind of cells. **3.** (An organ is made up of) **d.** different kinds of tissues. **4.** (An organ system is made up of organs that) **a.** work together to do a big job in your body. **5.** (Cells in your body multiply) **b.** by splitting in half.

Enrichment Activities

- Have students view slides of cells undergoing cell division. You can get prepared slides or students can prepare slides with a mixture of yeast, warm water, and sugar.
- Have students each find out more about a kind of cell from the body. Then have them each write a riddle about that cell.

Unit 2: Moving Parts

Target Words: *contracts, joints, muscular system, relaxed, skeletal system, skeleton*

Students learn about the skeletal and muscular systems, and how they work together so the body can move.

PAGE 12: **Your Bones**

The skeleton is made up of about 206 bones. It supports the body and gives it its shape. Certain bones protect the internal organs. Every bone is made up of hard bony tissue, marrow, ligament, and cartilage.

PAGE 13: **Your Joints**

A joint is where the ends of two bones meet. Students learn that certain joints let the body move in different ways. They learn what the hinge and ball-and-socket joints are. **Answers to activity: 1.** ball-and-socket **2.** ball-and-socket **3.** hinge **4.** ball-and socket **5.** hinge **6.** ball-and-socket

PAGE 14: **Muscles!**

The muscular system is made up of three kinds of muscles. All three kinds move different body parts. Skeletal muscles move the skeleton; smooth muscles, such as intestinal walls, move parts of internal organs. The third kind of muscle, cardiac muscle, is the heart.

PAGE 15: **How Your Muscles Work**

Two opposing skeletal muscles are needed in order for a body part to move. Students learn how the biceps and triceps work together to move the forearm.

1. When the forearm is raised, the *biceps* contracts, and the *triceps* relaxes. **2.** When the forearm is lowered, the *triceps* contracts and the *biceps* relaxes.

PAGE 16: **Check Yourself**

Across **2.** contracts **5.** skeleton **6.** muscular **7.** muscles *Down* **1.** bones **3.** relaxes **4.** joints

Enrichment Activities

- Invite a physical ed teacher to class. Have him or her demonstrate different stretching exercises.
- Have students take apart a chicken wing, and identify different muscle groups and the tissues that make up the bones.
- Have students compare the skeleton of Neanderthal man to their own skeleton.

Unit 3: Staying Alive

Target Words: *digest, digestive system, enzyme, nutrients, oxygen, respiratory system, waste products*

Students learn about the respiratory system and how it takes in oxygen. Then they learn about the digestive system and how it breaks down food into nutrients.

PAGE 18: **Your Respiratory System**

The nose, mouth, windpipe, and lungs make up the respiratory system. That system takes oxygen from air and rids the body of carbon dioxide.

PAGE 19: **What Happens When You Breathe?**

1. You breathe air in through your *nose.* You also breathe it in through your *mouth.* **2.** The air then goes down the *windpipe.* **3.** The air then goes into the *lungs.*

PAGE 20: **Your Digestive System**

The mouth, salivary glands, esophagus, stomach, small and large intestines, and anus make up the digestive system. That system breaks food down into the nutrients the cells use. The system does it in two ways: mechanical digestion—chewing with the teeth and churning motions by the stomach, and chemical digestion by enzymes and digestive juices.

PAGE 21: **What Happens to the Food You Eat?**

1. salivary glands **2.** esophagus **3.** stomach **4.** small intestine **5.** large intestine **6.** anus

PAGE 22: **A Model of the Stomach**

Materials: *a small jar, a cube of cooked beef, dilute hydrochloric acid* (You can buy dilute hydrochloric acid or prepare a solution of 256.5 ml of hydrochloric acid to one liter of distilled water.)

In this activity, students learn how hydrochloric acid digests food in the stomach. Caution students that acids can cause severe burns to the skin. (If a student touches acid, have him or her wash the affected part with water immediately.)

(Wording may vary) **a.** It was a whole piece of beef. **b.** It was many tiny pieces of beef. **c.** The hydrochloric acid digested the beef.

PAGE 23: **Check Yourself**

1. Your *respiratory* system moves air in and out of your body. **2.** The cells in your body use *oxygen* that's in the air you breathe. **3.** Carbon dioxide is a *waste product* that your cells make. **4.** Your mouth and your stomach make up part of your *digestive* system. **5.** *Nutrients* are the parts of food that your cells need. **6.** The chemicals that help digest food are *enzymes.*

Enrichment Activities

- Have students compare the breakdown time of hydrochloric acid on different foods. Follow the steps on page 22.
- Invite a nutritionist to class. Have him or her talk about how menus for school lunches are chosen.

Unit 4: The Movers and Removers

Target Words: *circulatory system, excrete, excretory system, lymph, lymphatic system*

Students learn that the circulatory system moves oxygen, nutrients, and waste products through the body; the lymphatic system traps and kills germs and bacteria; and the excretory system and other organ systems rid the body of toxic waste products.

PAGE 25: **The Stream of Life**

The circulatory system is made up of the heart, blood, and blood vessels—arteries, veins, and capillaries. That system moves oxygen, nutrients, and waste products through the body. Blood in the veins flows towards the heart.

PAGE 26: **Make a Model of a Heart**

Materials: *flour, water, a small, heavy plastic bag (or double-up a plastic bag), clear plastic straw, masking tape.*

Students discover that blood is pushed out of the heart when the heart contracts. Demonstrate how to squeeze the plastic bag. The squeezes should be short, quick ones instead of one long, hard squeeze.

The heart is relaxing between heartbeats.

PAGE 27: **Your Lymphatic System**

The lymphatic system is made up of lymph—a fluid full of nutrients—lymphatic vessels, and lymph nodes. That system continually bathes the cells with lymph, and carries waste products away from the cells. The lymph nodes trap and kill germs and bacteria before lymph with waste products returns to the bloodstream.

PAGE 28: **Getting Rid of Wastes**

Different organ systems get rid of the different waste products that are always forming in the body. The respiratory system gets rid of carbon dioxide that's formed after the cells use oxygen. The digestive system gets rid of solid waste that's formed from undigested food. **Answers to activity:** *Nose, Mouth, Windpipe, Lungs, Large Intestine*

PAGE 29: **A Carbon Dioxide Test**

Materials: *small jar, straw, bromothymol blue* (Bromothymol blue is a chemical that turns yellow in acid solutions. You can buy bromothymol blue or make your own solution of 0.5 grams of bromothymol blue powder to one liter of distilled water.)

Students discover that they get rid of carbon dioxide when they breathe out. Tell students to gently blow into the jar to prevent any splashing on clothes or face. (Bromothymol blue does not stain.)

You might want to show what happens when oxygen is put into the "changed" chemical. One way to do that is to put an air pump from an aquarium into the jar. **What's Happening? 1.** blue **2.** yellow **3.** carbon dioxide **4.** blue

PAGE 30: **Your Excretory System**

Students learn that two kidneys, the bladder, and the urethra make up the excretory system. That system gets rid of waste products formed from salts, chemicals, and water.

PAGE 31: **Check Yourself**

1. (Your circulatory system carries oxygen,) **b.** nutrients and waste products through the body. **2.** (Your lymphatic system carries) **d.** germs and bacteria to the lymph nodes. **3.** (Your digestive system excretes solid) **a.** waste products that form in the large intestine. **4.** (Your respiratory system takes out carbon) **c.** dioxide that forms in the cells. **5.** (Your excretory system excretes salts,) **e.** chemicals, and water that form in the cells.

Enrichment Activities

- Have students listen to each other's heart with a stethoscope.
- Invite someone such as a fireman or paramedic to talk about and demonstrate life-saving tactics.

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Unit 5: Systems That Control Your Body

Target Words: *action, endocrine system, hormone, messages, nervous system*

Students learn about the nervous and endocrine systems, and how they control body movements and actions.

PAGE 33: **Your Brain**

The nervous system is made up of brain, nerves, and sense organs. The brain controls the body by sending messages through the nerves. Different parts of the brain control different parts and functions of the body. Accept any reasonable answer such as legs, arms, feet, etc.

PAGE 34: **Your Sense Organs**

The body has several sense organs. Each organ gathers certain information. The main sense organs are the nose, ears, eyes, tongue, and skin. **Answers to activity:** (nose) smell; (eyes) sight; (ears) hearing; (tongue) taste; (skin) touch

PAGE 35: **Kinds of Action**

Students learn that every action a body part makes is voluntary or involuntary. Go over the actions listed and discuss what makes each action voluntary or involuntary.

Answers to last question may vary. Some answers for voluntary actions are talking, listening, holding phone receiver, and doodling. Some answers for involuntary actions are breathing, eyes blinking, and heart beating.

PAGE 36: **Your Endocrine System**

The endocrine system is made up of several endocrine glands scattered throughout the body. Each gland makes several hormones that control certain actions of organs. Those hormones are sent directly to the different organs through the bloodstream.

You may want to mention that the adrenal glands are above *and* behind the pancreas. Also, you may mention that the female gonads are inside the woman's body, and the male's are outside his body.

PAGE 37: **Glands in Action**

Students read about several situations, and then decide which endocrine gland is at work making hormones. Discuss each situation, talking about some emotions a person might feel as his or her body goes through chemical changes (for instance, how a person feels strong and powerful when the adrenal glands allow sugar into the bloodstream.)

PAGE 38: **Check Yourself**

1. Nervous (system) **2.** Sense organs **3.** Brain
4. Endocrine (system) **5.** Hormones

Enrichment Activities

- Ask a librarian or an English teacher for a list of sensitive fiction about teenagers going through puberty. Read one story aloud, then have your students write feelings about their own physical changes.
- Have students each pick an animal and find out what its nervous system is like.

Unit 6: Creating Life

Target Words: *embryo, fertilize, fetus, reproduce, reproductive system*

Students learn about the reproductive system and how that system allows for the continuation of life.

PAGE 40: **Starting from One Cell**

Students learn that a human being grows and develops from a fertilized cell. They learn that when a sperm cell joins an egg cell, a new life is created.

You might supplement this lesson with a brief lesson about genetics, teaching your students how chromosomes pass on traits to the new life cell.

PAGE 41: **The Reproductive Organs**

Students learn about some of the organs that make up the male and female reproductive systems. The male reproductive system is made up of the vas deferens, seminal vesicle, testicles, and penis. The female reproductive system is made up of the ovaries, fallopian tubes, uterus, and vagina. A cell develops into a baby in nine months.

PAGE 42: **Nine Months**

From the moment a sperm cell and an egg cell join, the fertilized egg begins developing and growing into a fetus. Students learn about some of its developments as it grows inside the uterus.

You might explain to your students that a different kind of cell division creates the new life cell. Once that new cell has formed, then cell multiplication begins, forming the different tissues, organs, and organ systems that make up the body.

PAGE 43: **Check Yourself**

Across **3.** reproduce **5.** organs **6.** fetus
Down **1.** fertilized **2.** sperm **4.** uterus **7.** egg

Enrichment Activities

- Have students observe and record the development of a tadpole.
- Have students each observe and record a child for a short period of time. Then have them talk about their observations.

Unit 7: Taking Care

Students learn the importance of taking care of their body. They learn what their body needs to stay healthy.

PAGE 44: **Eat Right!**

Protein and carbohydrate are two nutrients the body needs every day. (The third nutrient is fat.) It also needs a balance of vitamins and minerals. When there is an imbalance of nutrients, vitamins, and minerals, the body is vulnerable to sickness.

Some other foods that provide protein are eggs, poultry, and fish. All kinds of vegetables and fruits are sources of carbohydrate. Good sources of vitamin C are citrus fruits, melons, and tomatoes. Tofu, cheeses are also rich in calcium.

PAGE 45: **Watch Out!**

Cigarettes, alcohol, and drugs can upset the chemical balance in the body, especially when a person abuses his or her use of those things. Students do some research and find out how those things can damage the body.

Nicotine can irritate air sacs and weaken lung tissue, thus affecting the lungs' performance.

The liver stores glycogen and removes waste products from the bloodstream. Alcohol can irritate liver tissue, causing the liver cells to eventually waste away.

Nerve cells in the brain that are destroyed cannot regenerate.

Enrichment Activities

- Have students keep a record of all the foods they eat for a period of time, such as a week. Then, together, analyze their food patterns and make a balanced food plan for one day.
- As a group, write a short play about someone who is addicted to a drug.

Show What You Learned

PAGE 46: **What's the Answer?**

1. circulatory **2.** nervous **3.** respiratory
4. digestive **5.** reproductive **6.** muscular
7. lymphatic **8.** endocrine **9.** skeletal
10. excretory

PAGE 46: **What's the Word?**

1. Nutrients **2.** Hormone **3.** Cell **4.** Skeleton
5. Fetus **6.** Oxygen

TEACHING AIDS

Resources

Supply houses for prepared slides, frogs, etc.

- Carolina Biological Supply Company
  2700 York Road
  Burlington, NC 27215

- Fisher Scientific Company
  Educational Materials Division
  4901 West Lemoyne Avenue
  Chicago, IL 60651

Many of the following sources may have free printed information you can use, or they may have personnel willing to be guest speakers for your class:

- Lawrence Hall of Science, University of California, Berkeley, CA 94720
- A nearby hospital, health center, or medical center
- Local office of the American Red Cross
- Doctors, dentists, ophthalmologists, chiropractors, and other medical people in your area
- Science museums
- Medical schools
- Health and life insurance companies
- Health spas
- Sports trainers and dance instructors

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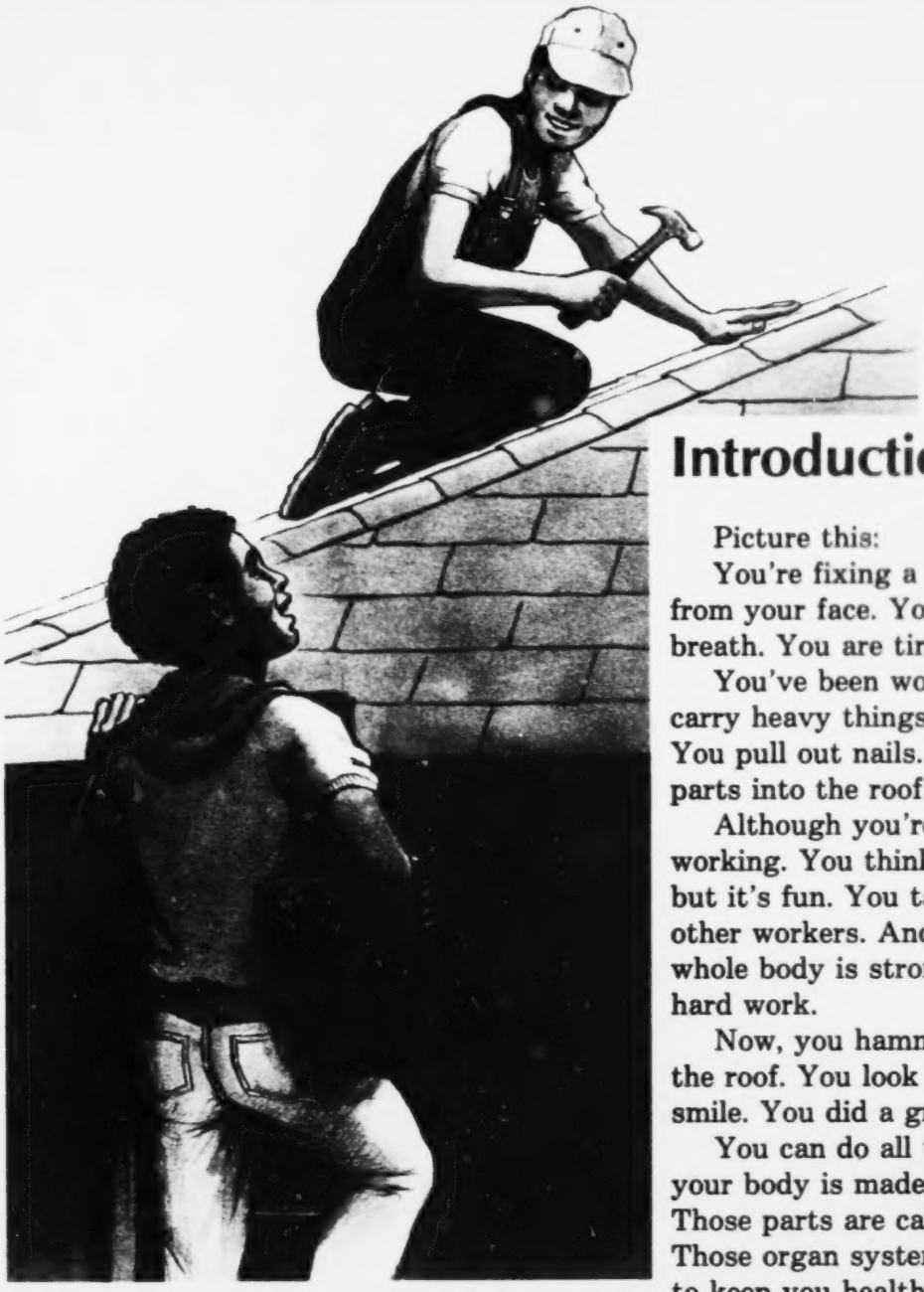


Introduction

Picture this:

You're fixing a roof. You wipe sweat from your face. You take in a deep breath. You are tired!

You've been working all day. You carry heavy things up and down a ladder. You pull out nails. And you hammer new parts into the roof.

Although you're tired, you keep working. You think: This work is hard, but it's fun. You talk and laugh with the other workers. And you feel that your whole body is stronger because of the hard work.

Now, you hammer the last nail into the roof. You look at your work and smile. You did a great job!

You can do all those things because your body is made up of different parts. Those parts are called *organ systems*. Those organ systems are always working to keep you healthy and strong. They work so you can climb ladders and use hammers. So you can think and talk, smile and breathe, and do so many other things.

In this book, you'll learn about some organ systems. You'll learn how they work to get what your body needs. You'll learn how all the organ systems work together to keep you alive. And you'll learn just how wonderful your body is!

Unit 1

You're Alive!

Think about this: You do many different things. You work. You play. You talk, think, and laugh. Many parts of your body work together so you can do those different things. Your body parts are always working. They keep you alive!

- What are the parts that make up your body?
- How do these parts work together?

You'll learn the answers in this unit.

Before You Start

You'll be using the science words below. Find out what they mean. Look them up in the Glossary that's at the back of this book. On the lines below, write what the words mean.

1. **cell** _____

_____

2. **multiply** _____

_____

What's Your Body Made Of?

The smallest living thing in the world is a *cell.* Cells make up everything that is alive.

You are alive. What are the smallest living things that make up your body?

Right, they are cells!

Cells make up every part of you. They make up your eyelids. They make up your hair and your bones. Name another part of your body that's made up of cells.

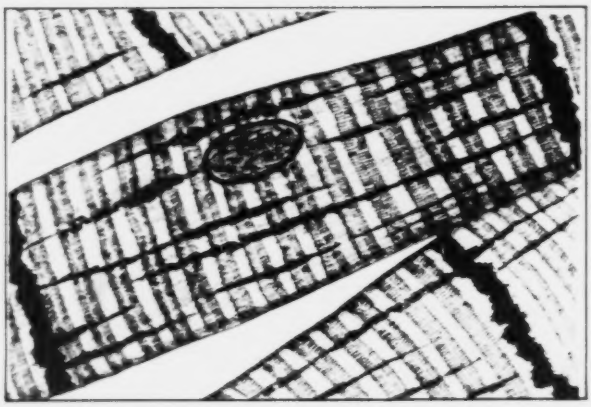
You have many different kinds of cells. A group of the same kind of cells is called a **tissue.** The cells that make up a tissue look alike. And they work together to do the same job. For example, your skin is made up of tissues. All the cells in the tissues look alike and they all do the same job.

Your body has different kinds of tissues. In some parts of your body, different tissues work together. When that happens, the tissues form an **organ.**

You have many organs. Your heart is an organ. What's another organ?

Certain organs work together to do one big job in your body. When organs work together, they make up an *organ system.* Your body has several organ systems. And each one does a special big job. One of your organ systems works so you can *breathe.* What's another big job that an organ system does?

Look at the pictures. Answer the question under the pictures.



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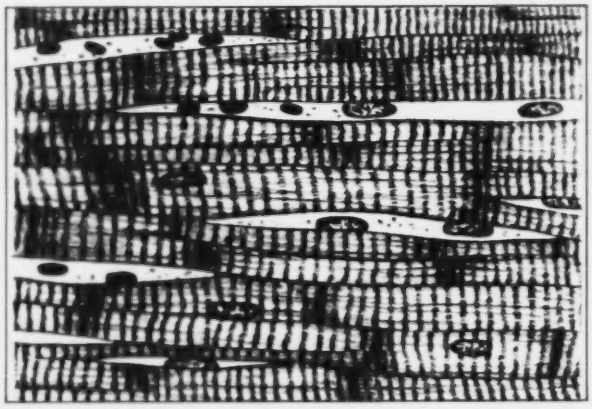

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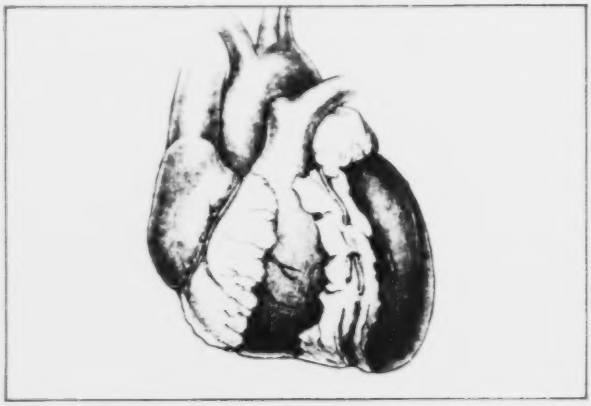


. . . an organ. What do organs make up?

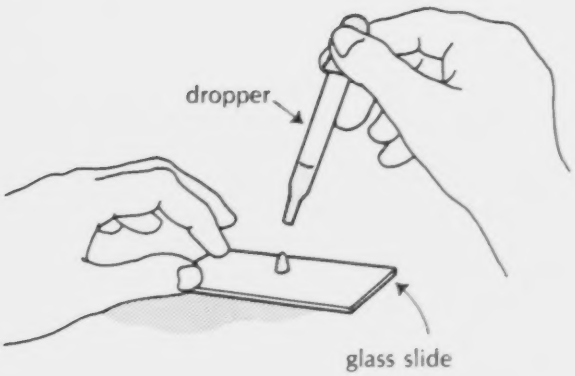
Close-Up of a Cell

See what a cell from your body looks like. You'll need a microscope and these materials:

- a toothpick (the kind that has a flat end)
- a dropper with water in it
- a glass slide
- a cover slip
- some methylene blue stain

1

Put a drop of water on the center of the glass slide.

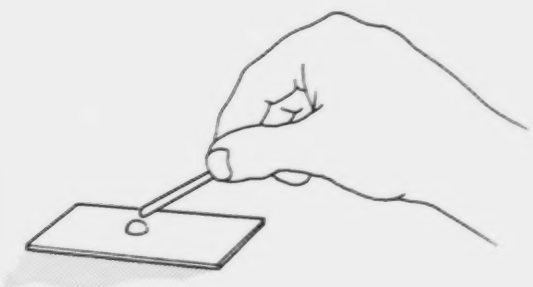


2

Gently scrape the inside of your cheek with the toothpick. (Use the flat end.)

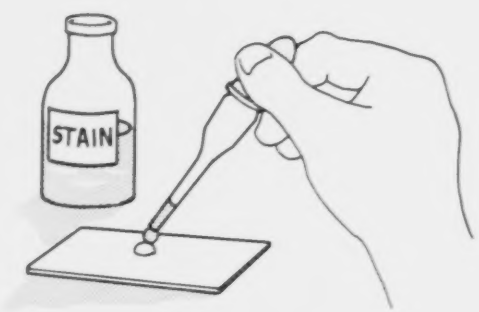
3

Put the flat end of the toothpick in the water. Stir it a few times.



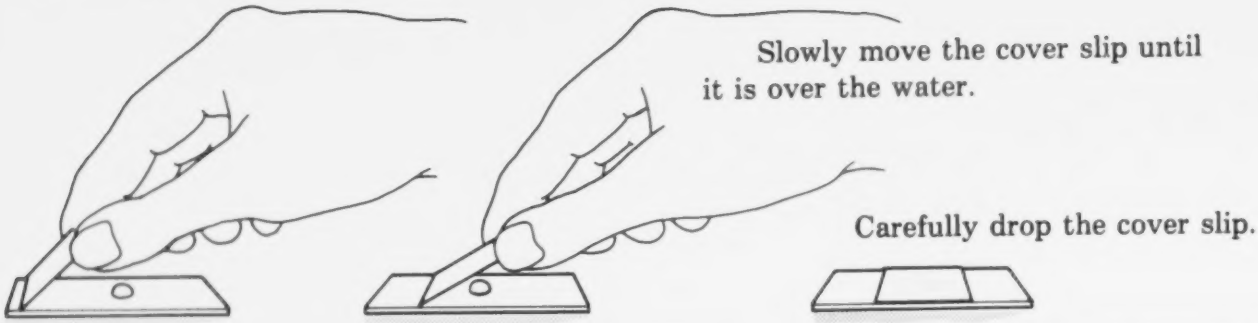
4

Add a drop of stain.



5

Hold the cover slip by its edges. Hold it at one end of the slide, the way this picture shows.

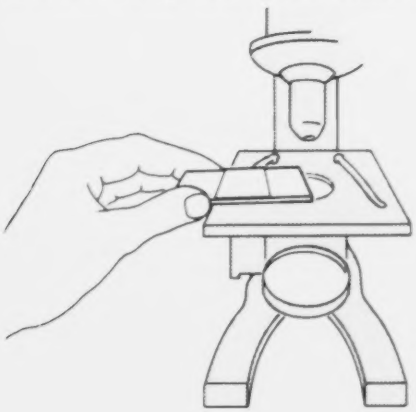


Slowly move the cover slip until it is over the water.

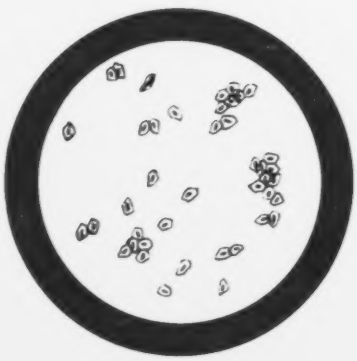
Carefully drop the cover slip.

6

Put the slide in the microscope. Turn to low power. Look into the lens. Focus it. You should see several purple dots. They are cheek cells.



You should see something like this under low power.



7

Keep looking at the cheek cells. Move the slide around until one of the cells is in the middle of the lens. Turn to high power. Focus the lens. You should now clearly see one cell. Draw that cell.

A cheek cell

7

Cells Multiply

You've probably seen pictures of yourself as a baby. Remember how small you were? Now, your body is much bigger.

Something happened to the cells in your body so that you got bigger. What do you think happened?

The cells in your body *multiplied.* That means the cells made more cells. As more cells were made, you grew.

How does a cell multiply? It splits in half. It becomes two cells. The pictures show a cell multiplying.

Look at picture **A**. It shows one cell. Notice the dark part inside the cell. That is where the cell will split in two.

Look at picture **B**. The dark part has just split in two. The two dark parts move away from each other. And a wall forms between them.

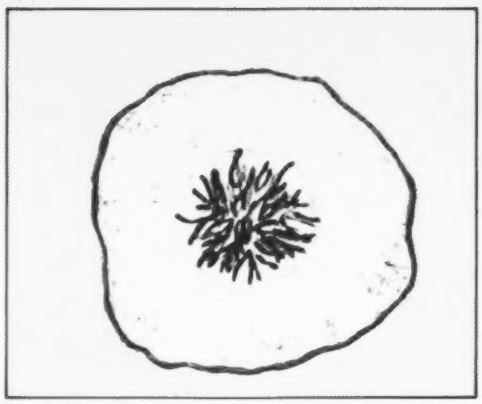
At a certain point, the wall is complete. When that happens, how many cells are there?

Right. There are two cells. In picture **C**, you can see what the two cells look like. Each cell is exactly like the other.

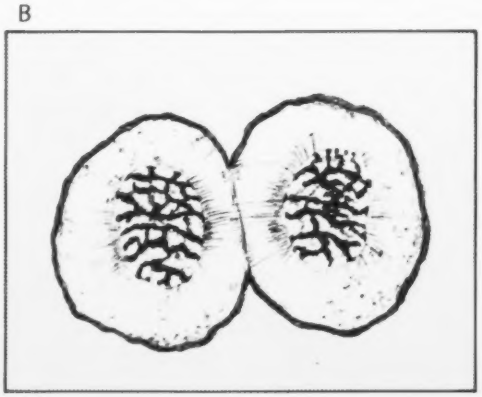
Suppose you cut your finger. Some skin cells are *destroyed* — killed. But in a few days, the cut heals. The skin over the cut is smooth. You have new skin cells. How does that happen?

Right. The cells that are around the cut multiply. And they make new skin cells.

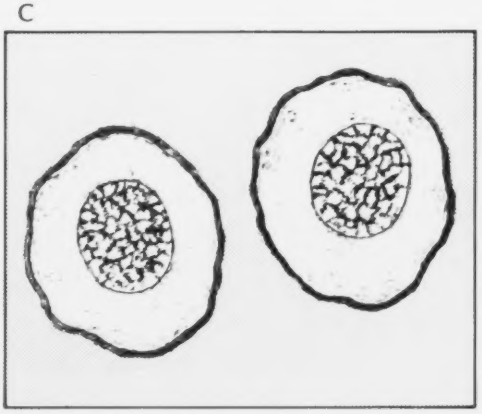
A



B

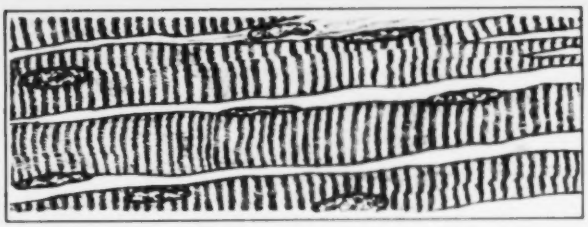


C



Close-Up of a Tissue

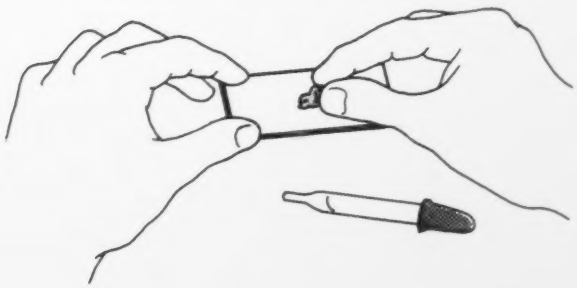
You can see what a tissue looks like. Get some raw hamburger meat. (Hamburger is muscle tissue. It looks a lot like muscle tissue that's in the human body.) Get these materials: a microscope, a dropper with water, a glass slide, and a cover slip.



Muscle tissue

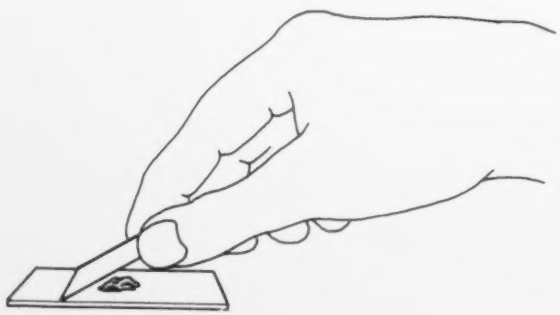
1

Put three drops of water on the slide. Add a little bit of hamburger to the water.



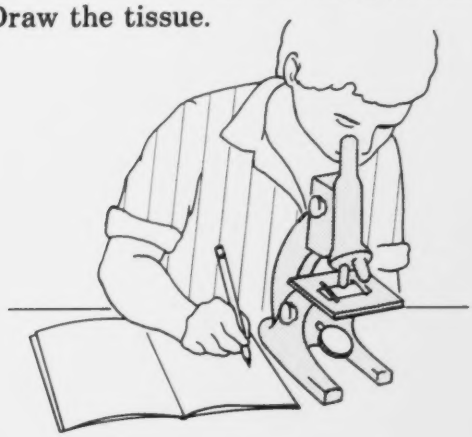
2

Put a cover slip over the hamburger. (Follow step 5 in "A Close-Up of a Cell" on page 7.)



3

Put the slide in the microscope. Turn to low power. Focus the lens. You should see tissue — cells that look alike. Now turn to high power. Draw the tissue.



Tissue

Check Yourself

Show what you learned in this unit. Finish these sentences. Draw a line from the words on the left to the correct words on the right. The first one is done.

1. A cell
2. A tissue is a group
3. An organ is made up of
4. An organ system is made up of organs that
5. Cells in your body multiply

a. work together to do a big job in your body.
b. by splitting in half.
c. is the smallest living thing.
d. different kinds of tissues.
e. of the same kind of cells.

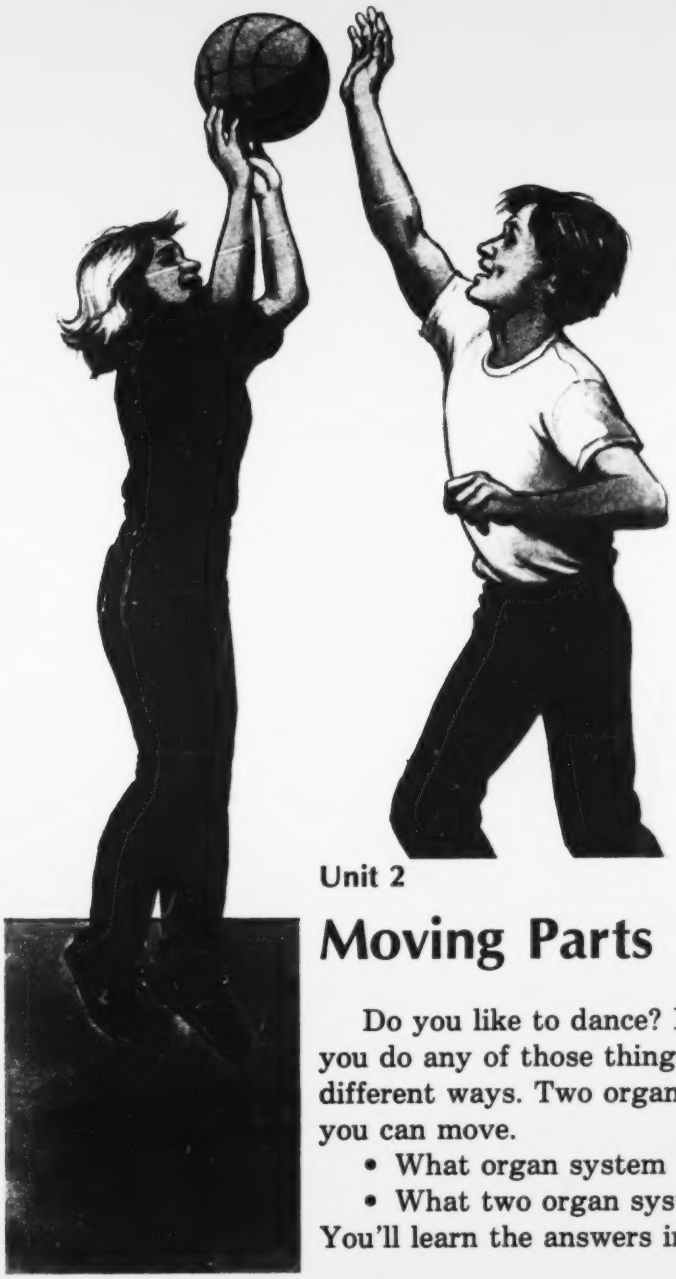
Check These Out

As you work through this book, keep a **Science Notebook.** Get a binder and three dividers. On the first divider, write *Science Work;* on the second, write *Keep Fit;* and on the third, write *In the News.*

At the end of every unit, you'll find some suggestions of activities you can do. Pick something for each section of your notebook. Put each thing you do behind the right divider.

Here are some things with which to start your Science Notebook:

1. *Science Work:*
   a. With a microscope, look at slides of different cells. Draw the cells, label your drawings, and put them in your Science Notebook.
   b. See what bone cells look like. Get a bone from a butcher. Dry the bone, then carefully scrape it with a sharp blade. Make a slide with the scrapings and look at them under the microscope. Draw and label what you see. Put the drawing in your notebook.
   c. A cell is made up of different parts. Look in the encyclopedia and find out what the parts are. Then make a drawing of a cell and label its different parts.
   d. A cell lives for a certain number of days. Find out how long these cells live: the nerve cell, the red blood cell, and the skin cell. Take notes and put them in your Science Notebook. Then give (or tape) an oral report to the class about the cells.
2. *Keep Fit:* Your cells need *minerals* and *vitamins.* Find out what they are. Put your notes in your notebook.
3. *In the News:* Sometimes sick cells in a tissue multiply and outnumber the healthy cells. This is called *cancer.* In magazines or newspapers, find articles about cancer. Cut out those articles. Paste them on notepaper and put them in your Science Notebook.



Unit 2

Moving Parts

Do you like to dance? Run? Play basketball? When you do any of those things, your body moves in many different ways. Two organ systems work together so you can move.

- What organ system holds you up?
- What two organ systems let you move?

You'll learn the answers in this unit.

Before You Start

You'll be using the science words below. Find out what they mean. Look them up in the Glossary. On the lines below, write what the words mean.

1. **joint** _____

_____

2. **skeleton** _____

_____

Your Bones

Stand up. What keeps your body from falling?

Right. Your *skeleton* keeps your body from falling. It *supports* your body.

Your skeleton makes up your **skeletal system.** It is made up of about 206 bones. They protect the soft parts of your body and give your body its human shape.

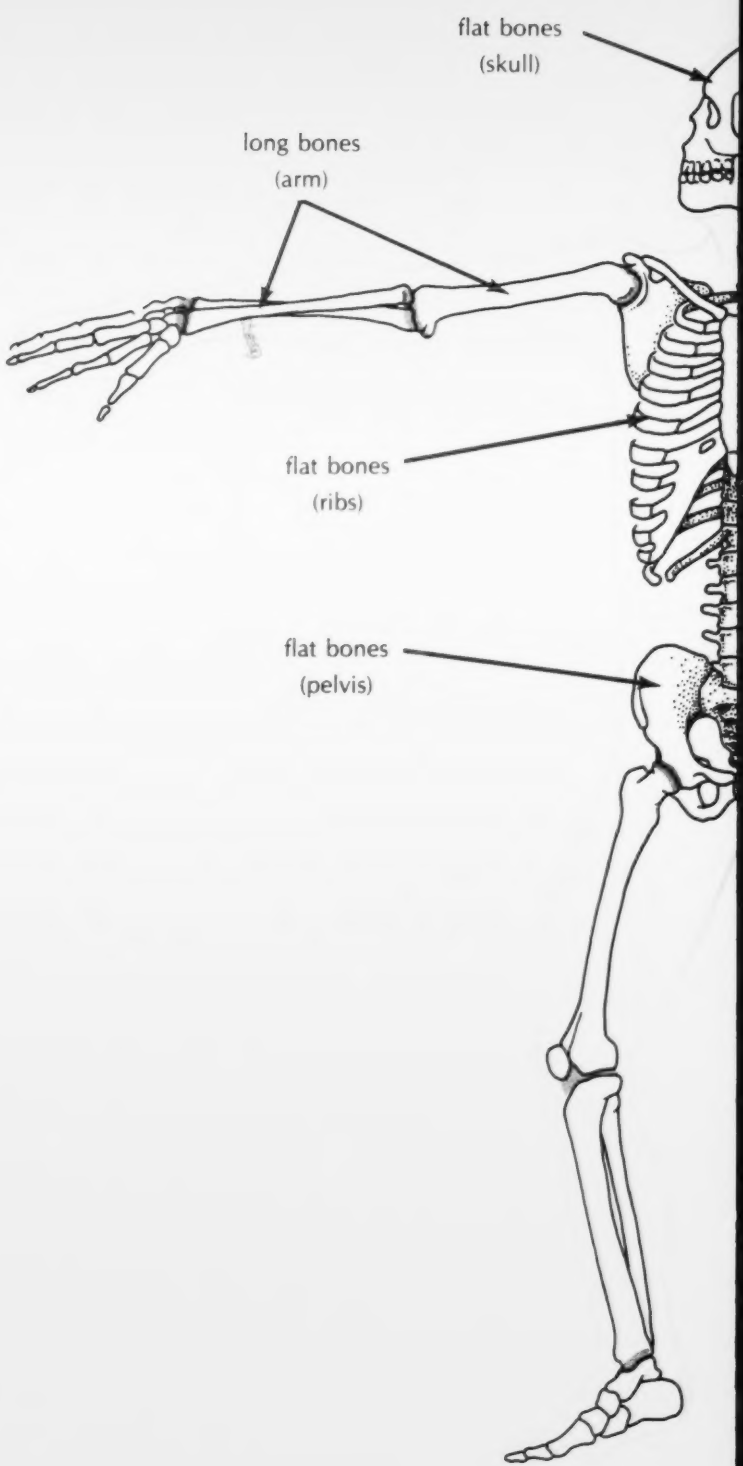
Bones are organs. They are made up of tissues. The outside of a bone is hard tissue. Minerals such as calcium are stored there. The inside of a bone is soft tissue, or *marrow.* Red blood cells are made in the marrow of certain bones.

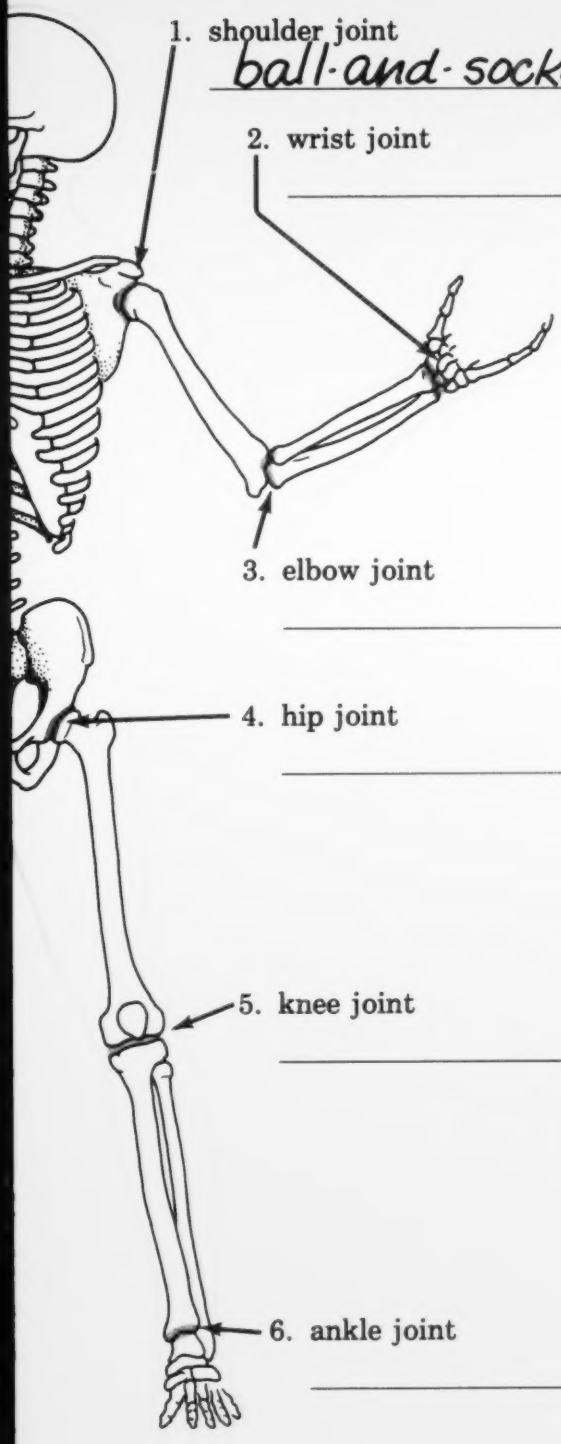
All the bones are *connected* to each other. They are joined together by tissues called *ligaments.* Another tissue — *cartilage* — is between the bones. The cartilage protects the ends of the bones. It keeps the bones from rubbing against each other.

Look at the diagram. Notice that the bones have different shapes. Some bones are called *flat bones.* They curve around soft organs such as your heart and lungs. They protect those organs. For example, your ribs protect your lungs and heart.

Some bones are called *long bones.* They are round and straight. They let you move your body. The bones in your arms are long bones. What other parts of your body have long bones?

On the diagram write *long bones* next to those bones.





1. shoulder joint ball-and-socket

2. wrist joint _____

3. elbow joint _____

4. hip joint _____

5. knee joint _____

6. ankle joint _____

Your Joints

Stretch out your hand. Now bend your fingers. See how each finger is made up of several bones? You can bend your fingers because of certain parts at the ends of those bones. What are those parts called?

_____

Those parts are called *joints.*

Your skeleton has different kinds of joints that let you move. One of those is called a *hinge* joint. Think of the hinges on a door. Your hinge joint is something like a door hinge. It lets you move parts of your body the same way a door moves: back and forth.

The knuckles on your fingers are hinge joints. Your knee is a hinge joint on your leg. What hinge joint is on your arm?

_____

Another kind of joint you have is called a *ball-and-socket* joint. It lets you move parts of your body in any direction. You can find that kind of joint in your shoulder, at the top of your arm. Touch that joint. Move your arm in wide circles. Then, bend your arm. See how the two movements are different?

Now, look at the diagram of the skeleton. Finish writing *hinge* or *ball-and-socket* next to each joint. (The first one is written.)

Muscles!

Blink your eyes. Swallow. Stand up and take a step. Every time you do those things, parts of your body move.

What parts move when you blink your eyes?

_____

What parts move when you swallow?

_____

What parts move when you take a step?

_____

Your body moves in those ways because of a certain kind of organ: *muscles.* All the muscles in your body make up your **muscular system.**

Your body has three kinds of muscles. One kind of muscles moves just your skeleton. Those muscles are called *skeletal muscles.*

Another kind moves parts of organs inside your body. Those muscles are called *smooth muscles.* Your stomach has smooth muscles.

The third kind of muscle is very special. It makes up a whole organ. That organ pumps blood through your body. What is that organ?

_____

Right! It's your heart.

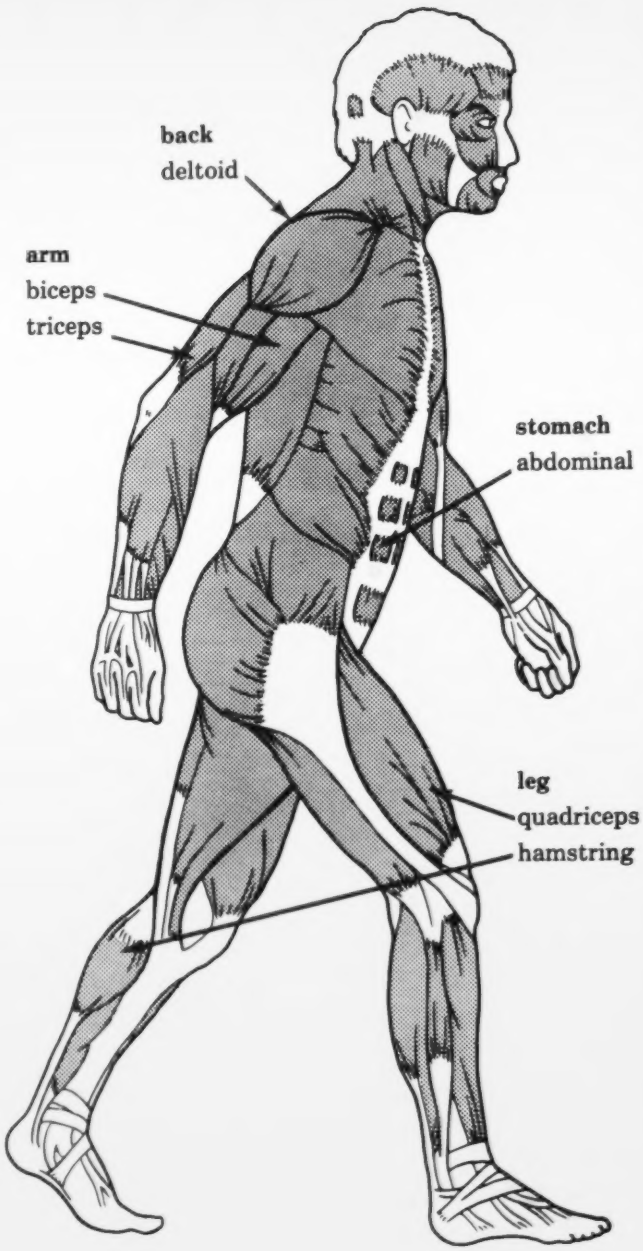
Now look at the diagram. It shows the muscles that move your body. Which kind are they: heart muscle, smooth muscle, or skeletal muscle?

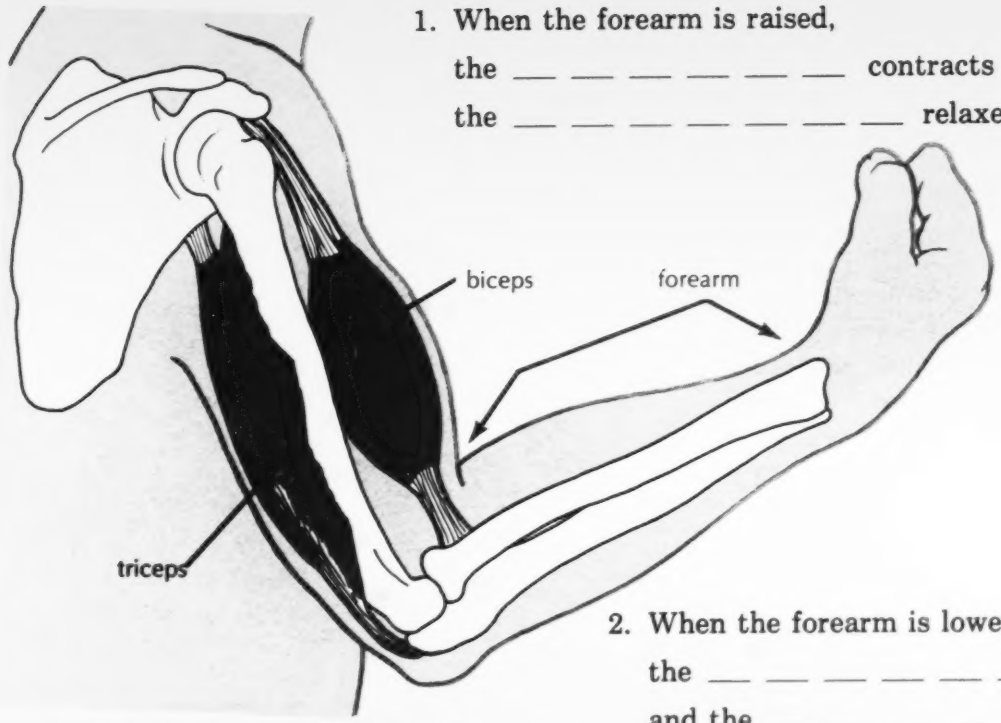
_____

Find the two muscles that are on the arm. What are their names?

_____

_____





1. When the forearm is raised,
   the ___ ___ ___ ___ ___ ___ contracts and
   the ___ ___ ___ ___ ___ ___ ___ relaxes.

2. When the forearm is lowered,
   the ___ ___ ___ ___ ___ ___ ___ contracts
   and the ___ ___ ___ ___ ___ ___ relaxes.

How Your Muscles Work

Put your elbow on your desk. Move your forearm up and down. (That's the part of your arm below your elbow.) How many muscles do you use?

You use two skeletal muscles. You use one muscle to lift your forearm. You use another to lower it.

Skeletal muscles are made of long tissues. The ends of those tissues are attached to bones. You move when the muscles pull those bones.

A muscle can pull a bone only in one direction. So two muscles are needed to move a body part. One muscle pulls a bone in one direction. And the other muscle pulls it back.

When a muscle pulls a bone, it **contracts** and gets shorter. It pulls the bone toward it. The muscle **relaxes** and gets longer when another muscle pulls the bone.

Your biceps and triceps are two muscles that work together. They move your forearm. Put your hand on the middle of your upper arm. Bend your arm. You should feel a lump. That is your biceps. It pulls your forearm *up*. Does the biceps contract or relax?

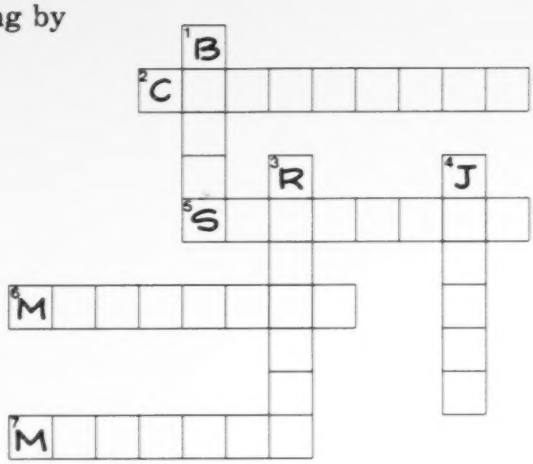
Right. Your biceps contracts.

Now lower your forearm. You should feel the biceps relax. That means your triceps is contracting. The triceps pulls the bone in your forearm *down*.

Look at the diagram. It shows the muscles that move your forearm. Finish the sentences on the diagram. Write *biceps* and *triceps* where they belong.

Check Yourself

Use words from this unit to do the crossword puzzle. The clues below will help you. In the puzzle, each word is started for you. Check your spelling by looking at the page after each clue.



Across

2. When a muscle gets shorter. (page 15)
5. This supports your body. (page 12)
6. This system makes the parts of your body move. (page 14)
7. What biceps and triceps are. (page 14)

Down

1. These make up your skeletal system. (page 12)
3. When a muscle gets longer. (page 15)
4. The places where ends of bones meet. (page 13)

Check These Out

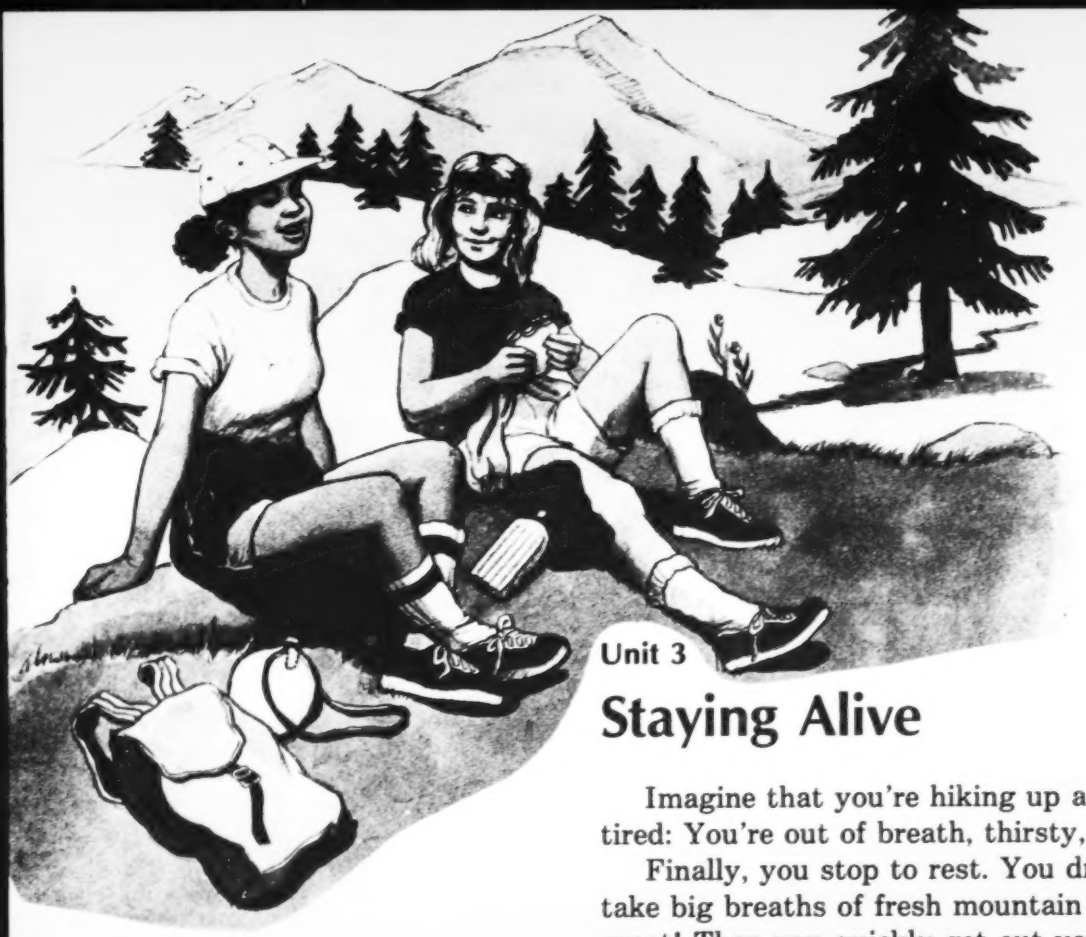
1. For your Science Notebook:
   a. *Science Work:*
      - Get prepared slides of skeletal muscle and smooth muscle. Look at each one in the microscope. Draw what you see.
      - Get a long bone of an animal from a butcher. Find the different parts of the bone. (Use an encyclopedia or science book to help you.) Make a drawing and label the parts.
      - Get a whole leg of a chicken. (The leg bone and thigh bone are connected.) Find these tissues: cartilage, marrow, and bony tissue.

   b. *Keep Fit:* Good posture keeps all your organ systems working in good order. Find out what good posture looks like. Then find out what kind of posture you have.

   c. *In the News:* Many diseases can affect your skeletal and muscular systems. For instance, arthritis is a disease in the joints. Find an article about a disease that affects your skeleton or muscles.

2. As you work through this book, you may want to find out more about the human body. You can find out more by looking in an encyclopedia or by getting books from a library. You can also talk to an expert, such as a doctor or a science teacher.

   Here are some things you may want to find out:
   - What is muscle tone?
   - What is aerobic exercise?
   - What is the Achilles' heel? The funny bone?



Unit 3

Staying Alive

Imagine that you're hiking up a mountain. You're tired: You're out of breath, thirsty, and hungry.

Finally, you stop to rest. You drink water. You take big breaths of fresh mountain air. You feel great! Then you quickly get out your lunch.

Your body needs the things that are in air, water, and food. Without them you would die. Two organ systems get those things for your body.

- What are the things that your body needs?
- What organ systems get those things?
- How does each organ system work?

You'll learn the answers in this unit.

Before You Start

You'll be using the science words below. Find out what they mean. Look them up in the Glossary. On the lines below, write what the words mean.

1. **digest** _____

_____

2. **enzyme** _____

_____

3. **waste products** _____

_____

Your Respiratory System

Every cell in your body needs **oxygen**. Oxygen is one of the gases in the air. How does oxygen get into your body?

Your body gets oxygen when you breathe.

The organs that let you breathe make up your **respiratory system.** That system takes the oxygen out of the air that you breathe *in.* It also gets rid of a waste product cells make when they use oxygen. That waste product is *carbon dioxide.*

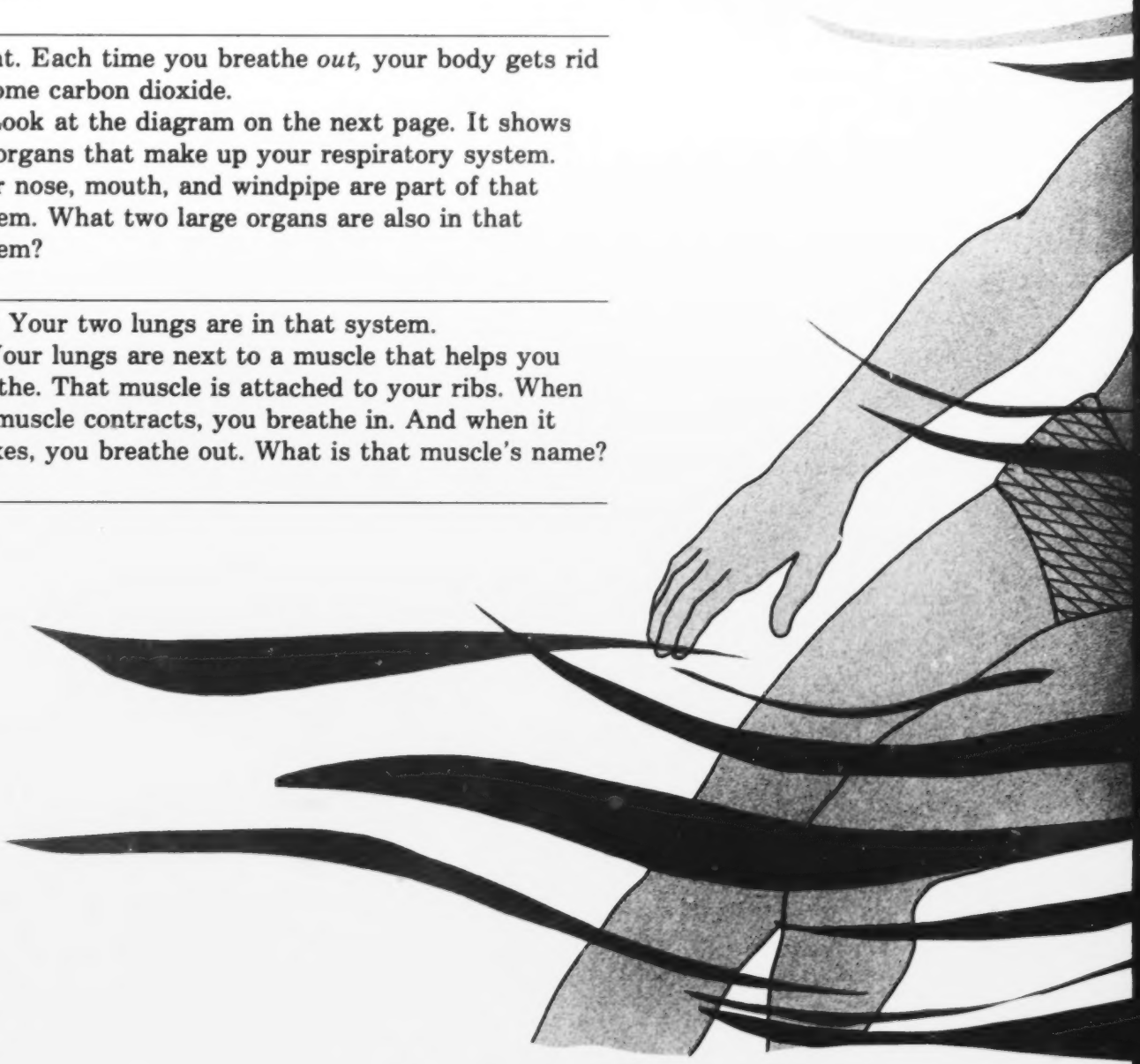
How do you think your body gets rid of carbon dioxide?

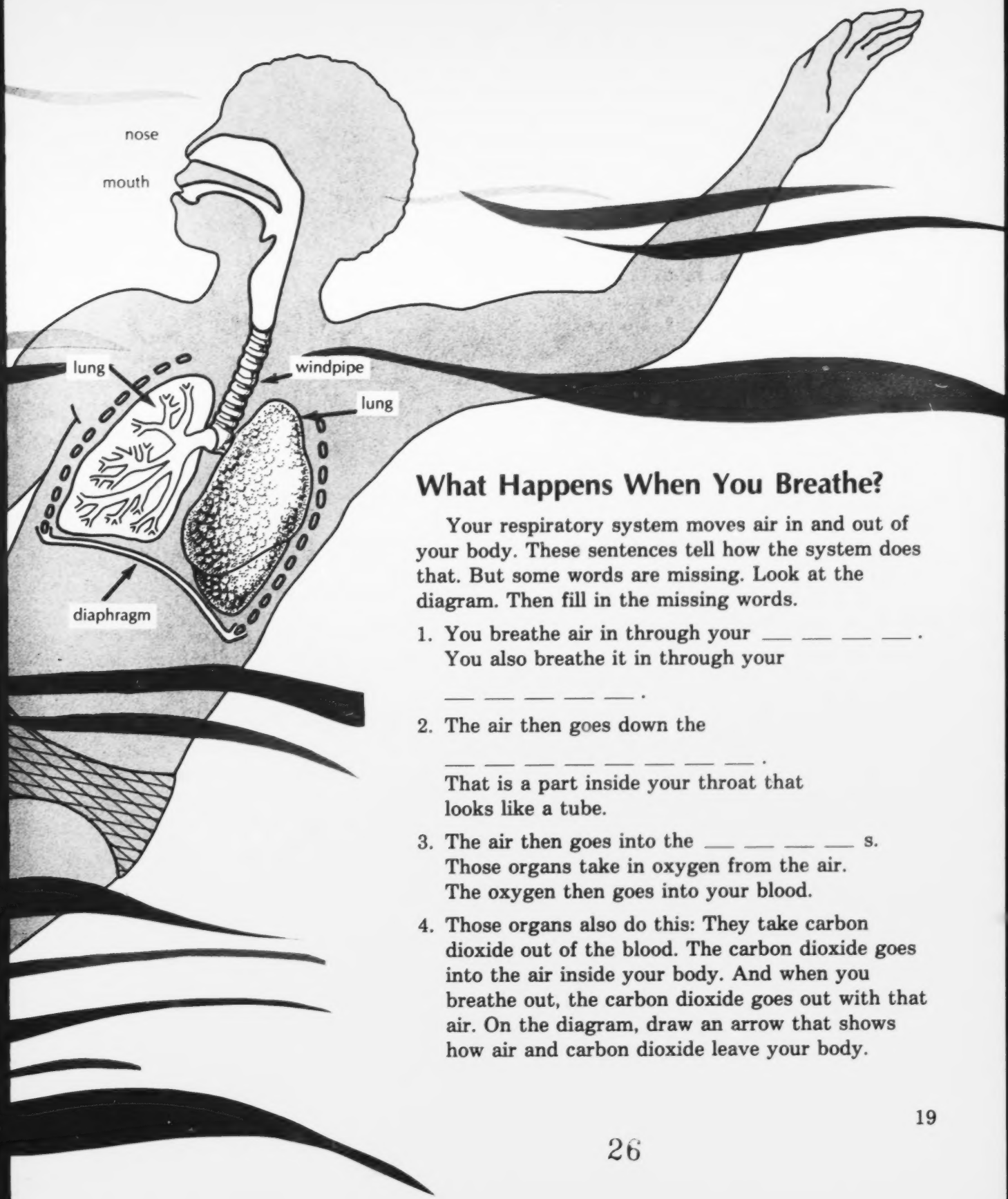
Right. Each time you breathe *out,* your body gets rid of some carbon dioxide.

Look at the diagram on the next page. It shows the organs that make up your respiratory system. Your nose, mouth, and windpipe are part of that system. What two large organs are also in that system?

Yes! Your two lungs are in that system.

Your lungs are next to a muscle that helps you breathe. That muscle is attached to your ribs. When the muscle contracts, you breathe in. And when it relaxes, you breathe out. What is that muscle's name?





What Happens When You Breathe?

Your respiratory system moves air in and out of your body. These sentences tell how the system does that. But some words are missing. Look at the diagram. Then fill in the missing words.

1. You breathe air in through your ___ ___ ___ ___. You also breathe it in through your ___ ___ ___ ___ ___.
2. The air then goes down the ___ ___ ___ ___ ___ ___ ___ ___. That is a part inside your throat that looks like a tube.
3. The air then goes into the ___ ___ ___ ___ s. Those organs take in oxygen from the air. The oxygen then goes into your blood.
4. Those organs also do this: They take carbon dioxide out of the blood. The carbon dioxide goes into the air inside your body. And when you breathe out, the carbon dioxide goes out with that air. On the diagram, draw an arrow that shows how air and carbon dioxide leave your body.

Your Digestive System

How do you feel when you don't eat for awhile? Tired? Or full of energy?

Your body gets tired when you don't eat for awhile. That's because food gives your body energy. It also gives your body **nutrients** — the things cells need to stay alive.

Before your body can use what you eat, it must *digest* that food: It must break food down into very tiny bits. The organs that digest food make up your **digestive system.**

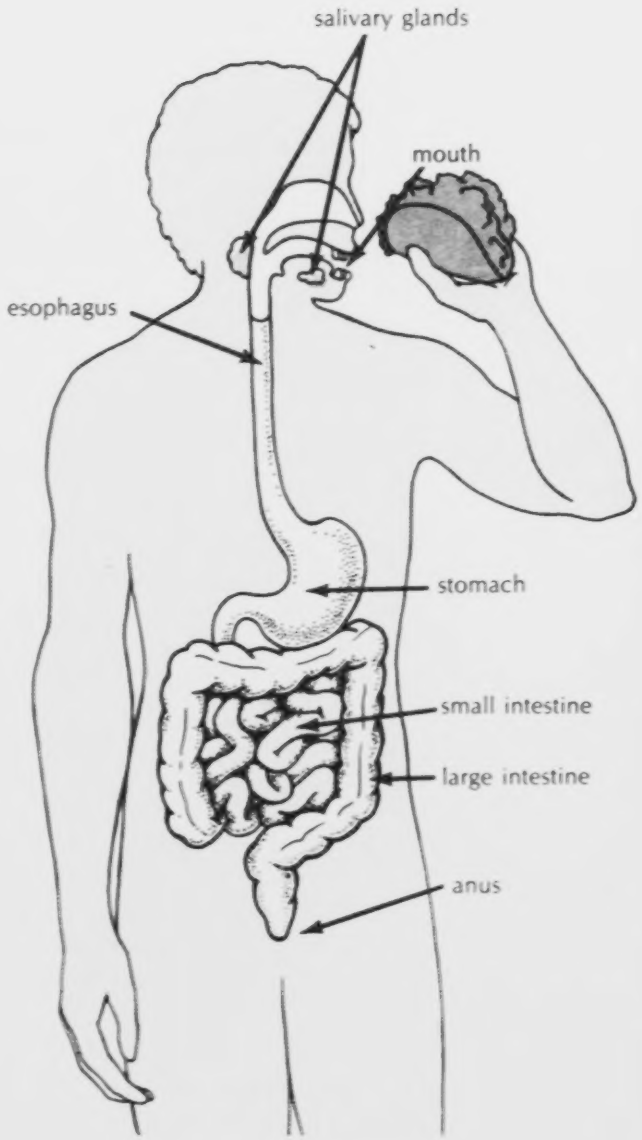
The diagram on this page shows the digestive system. The system looks like a long tube that goes through the body. Food that you eat travels through that tube. Look at the diagram. What organ first starts to digest the food?

The mouth begins digesting food. Many foods are hard and solid. Your system breaks those foods down in several ways. One way is this: It cuts food into small pieces. Your teeth do that when you chew.

Your system also breaks food down by mashing it. That's what happens to food in your stomach.

Strong chemicals can also break food down. Your digestive system has glands that make *enzymes* and *digestive juices.* Those chemicals can break food down into a liquid form.

You can see how enzymes work. The saliva in your mouth has an enzyme. Put a cracker in your mouth. Don't chew it. What happens to the cracker?



What Happens to the Food You Eat?

The sentences below tell what happens to food you eat. Read the sentences, then read the questions after them. Look at the diagram on the other page and write the answers to those questions.

1. You put food into your mouth and chew it. Your teeth cut the food into small pieces. Glands in your mouth give off an enzyme in saliva. It begins to digest the food. What are the glands?

   — — — — — — — — glands

2. You swallow the pieces of food. They move down a part that is like a tube. What is that part?

   — — — — — — — — — —

3. The pieces of food next go into an organ. It mashes the pieces into tiny bits. What is that organ?

   — — — — — — — —

4. The tiny bits of food then go into another organ. There, enzymes break the bits down into nutrients. And the organ's wall takes in the nutrients. (The nutrients then go into the blood.) What is that organ?

   — — — — —

   — — — — — — — — — —

5. Some parts of food can't be broken down. Those parts move all through the digestive system. They finally go into an organ and become solid wastes. What is that organ?

   — — — — —

   — — — — — — — — — —

6. The solid wastes are pushed out of the body. Through what part do the wastes go out?

   — — — —

A Model of the Stomach

Your stomach makes an acid that helps it digest food. That acid is called *hydrochloric acid.* You can easily see how that acid breaks down food. You'll need these materials:

- a small jar (such as a pickle jar)
- a small piece of cooked beef
- some dilute hydrochloric acid

1

Put the piece of beef in the jar.

2

Ask your teacher to add some dilute hydrochloric acid. (That acid is like the acid in your stomach.) It should cover the beef.

CAUTION: Some acids burn! So don't touch acids. If an acid spills on you, wash it off.

3

Put the jar in a safe place for one day. On the next day, look at the beef. Then answer these questions.

a. What did the beef look like before it was covered with acid?

_____

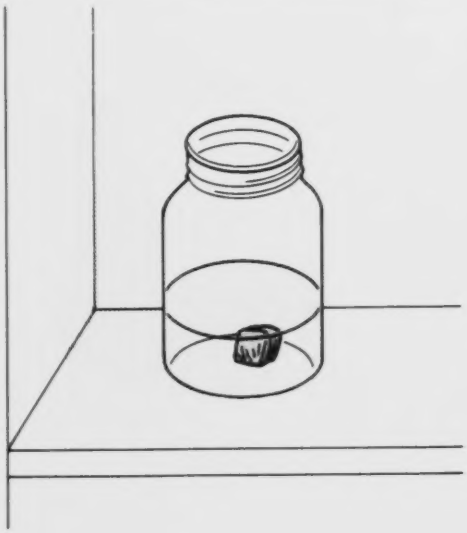
b. What did the beef look like one day later?

_____

c. What happened to the beef?

_____

_____



Check Yourself

Show what you learned in this unit. Finish these sentences. The words you'll need are listed below.

digestive	**oxygen**
enzymes	**respiratory**
nutrients	**waste product**

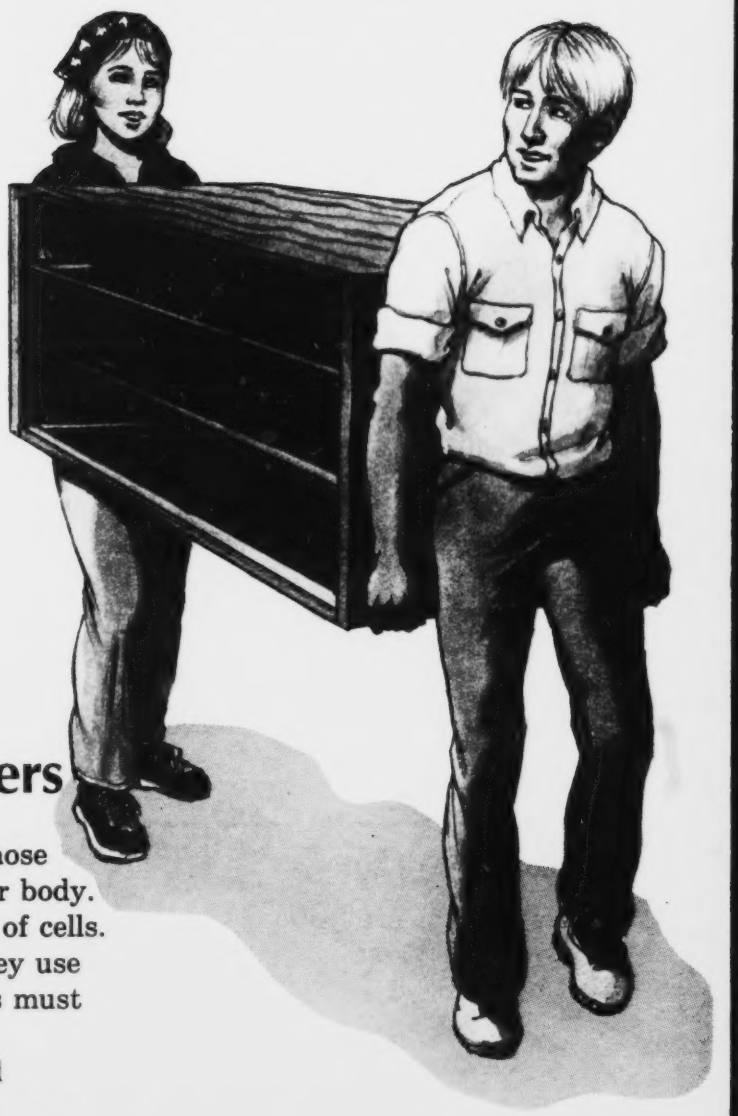
1. Your _____ system moves air in and out of your body.
2. The cells in your body use _____ that's in the air you breathe.
3. Carbon dioxide is a _____ _____ that your cells make.
4. Your mouth and your stomach make up part of your _____ system.
5. _____ are the parts of food that your cells need.
6. The chemicals that help digest food are _____.

Check These Out

1. For your Science Notebook:
   a. *Science Work*:
      - Carbohydrate is a nutrient that your body needs. Find out what foods have that nutrient. Get a bottle of iodine, bread, milk, a fruit, and a piece of meat. Put drops of iodine on each food. If the food has carbohydrate, the iodine will turn a dark blue. Which foods have carbohydrate?
      - Get a prepared frog. With your class, dissect it (cut it open). Draw its digestive and respiratory systems.

   b. *Keep Fit:* Carbohydrates, protein, and fat are the nutrients you need. Find out what each nutrient does for you. And what foods supply each nutrient.

   c. *In the News:* Many people go on *fad diets* to lose weight. Find an article about a fad diet.
2. Smoking cigarettes can cause lung cancer. Invite a doctor or a nurse to talk about lung cancer.
3. Invite a dentist to speak to your class.
4. The liver, pancreas, and gall bladder help digest food. Find a picture that shows those organs. (Look in an encyclopedia.) What else do they do?
5. Here are more things you may want to find out:
   - Who was Dr. William Beaumont?
   - What is anorexia? Bulimia?
   - What is *metabolism?*



Unit 4

The Movers and Removers

Your cells need oxygen and nutrients. Those things must somehow move all through your body. They must get to every one of your billions of cells.

Your cells make waste products when they use oxygen and nutrients. Those waste products must move out of your body.

- What organ systems move oxygen and nutrients?
- What organ systems move waste products?
- Why must the body get rid of waste products?

You'll learn the answers in this unit.

Before You Start

You'll be using the science words below. Find out what they mean. Look them up in the Glossary. On the lines below, write what the words mean.

1. **excrete** _____

_____

2. **lymph** _____

_____

The Stream of Life

You have something that moves like a river inside your body. It flows to every part of your body. As it flows it carries things. What do you think it is?

Did you say *blood?* Right! Blood moves throughout your body. It flows through parts called *blood vessels.*

Blood and blood vessels are part of your **circulatory system.** That system moves things such as oxygen and nutrients throughout your body. What important organ is also part of that system? Look at the diagram.

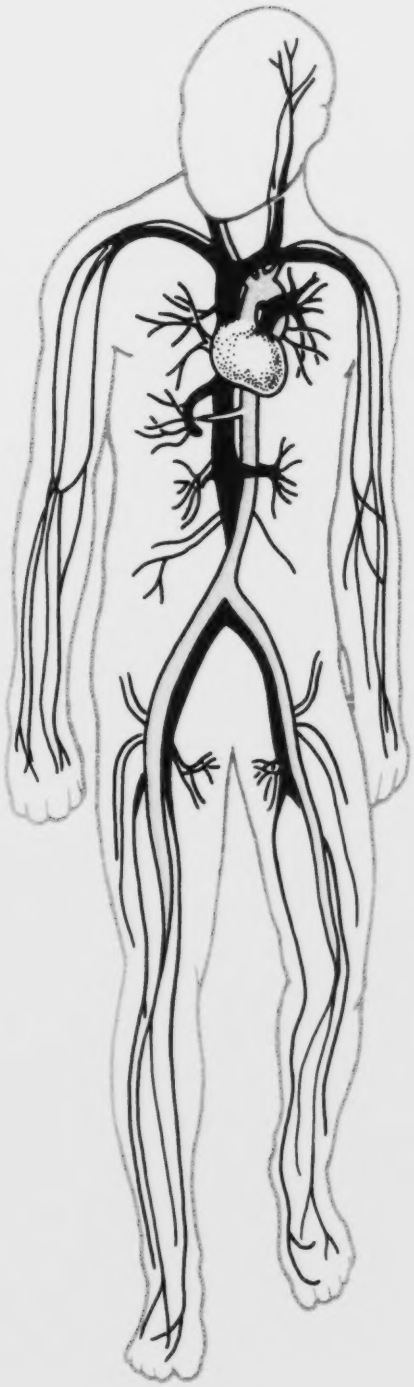
Yes, it's your heart.

Blood always moves one way: It flows from your heart to your cells, then back to your heart, and so on.

Blood flows away from your heart through blood vessels called *arteries.* That blood carries oxygen from the lungs. It carries nutrients from your small intestine. It carries those things to the cells. As the blood gets closer to the cells, it flows through smaller and smaller arteries.

In the tissues, the blood flows through very thin and tiny blood vessels called *capillaries.* The oxygen and nutrients in the blood leave the capillaries and go to the cells. Waste products leave the cells and go to the capillaries.

The blood in the capillaries now carries waste products. It flows to bigger blood vessels called *veins.* In the veins, the blood now flows toward an organ. What organ is it?

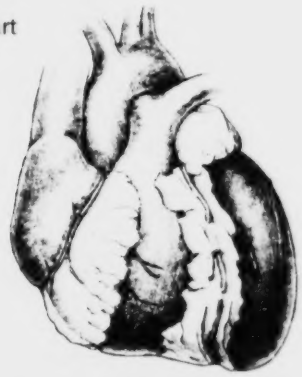


Make a Model of a Heart

Blood *circulates* — moves — through your body because of your heart. Your heart is something like a bag made of muscle. When the muscle relaxes, blood from the veins goes into the heart. When the muscle contracts, it squeezes the blood out of the heart. That blood is pushed into the arteries.

Make a model of the heart, and see how that happens. Here's how:

The heart

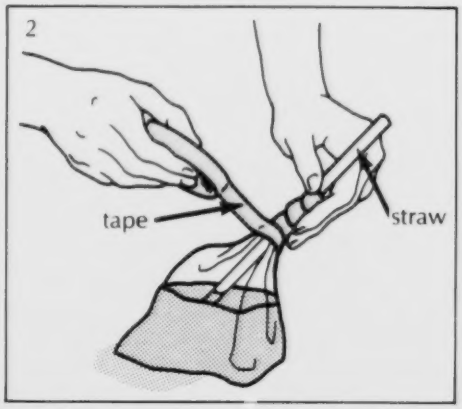


1

Mix ½ cup of flour and ½ cup of water. Pour the mixture into a small, heavy plastic bag. The mixture stands for blood.

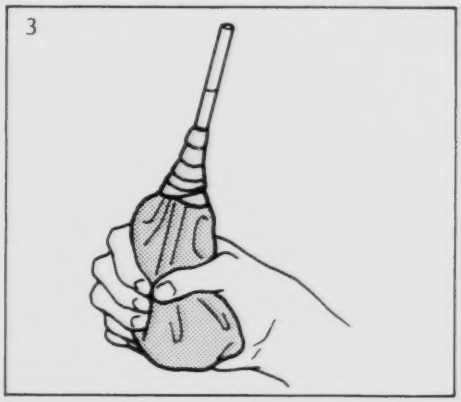
2

Put a clear plastic straw into the bag. The straw stands for the artery. Gather the top of the bag around the straw. Wrap tape tightly around it. Make sure the tape covers the top completely.



3

Wrap your hand around the bag. Your hand and the bag stand for the heart. Gently squeeze the bag, open your hand, and squeeze gently again. Do that for awhile. Where does the mixture go?



The mixture goes into the straw. That's the way blood leaves the heart and goes into the arteries. Each time you squeeze the bag, more mixture is pushed into the straw. It pushes the mixture that is already there. That's the way blood is pushed through the arteries.

Listen to your heart. Hear it beat? Every time it beats, it contracts, and that pushes blood out of the heart and through the blood vessels.

What's happening in your heart when you don't hear the beat?

Your Lymphatic System

Another organ system moves things throughout your body. It is your **lymphatic system.** It is made up of parts called *lymph, lymphatic vessels,* and *lymph nodes.*

Lymph is one of the fluids that flow in your *bloodstream.* When your blood flows through the capillaries, the lymph leaks out. It flows through the tissues. As it flows, it carries things such as nutrients to the cells. It also carries things away from the cells. What do you think it carries away?

_____

Yes! It carries away waste products that cells make. It also carries away germs and bacteria that have gotten into the tissue.

The lymph returns to the bloodstream. It returns through lymphatic vessels. (Those vessels cover every part of the body.)

As the lymph moves through the vessels, it passes through many lymph nodes. Those glands are tiny, round parts. They trap and kill the germs and bacteria that are in the lymph.

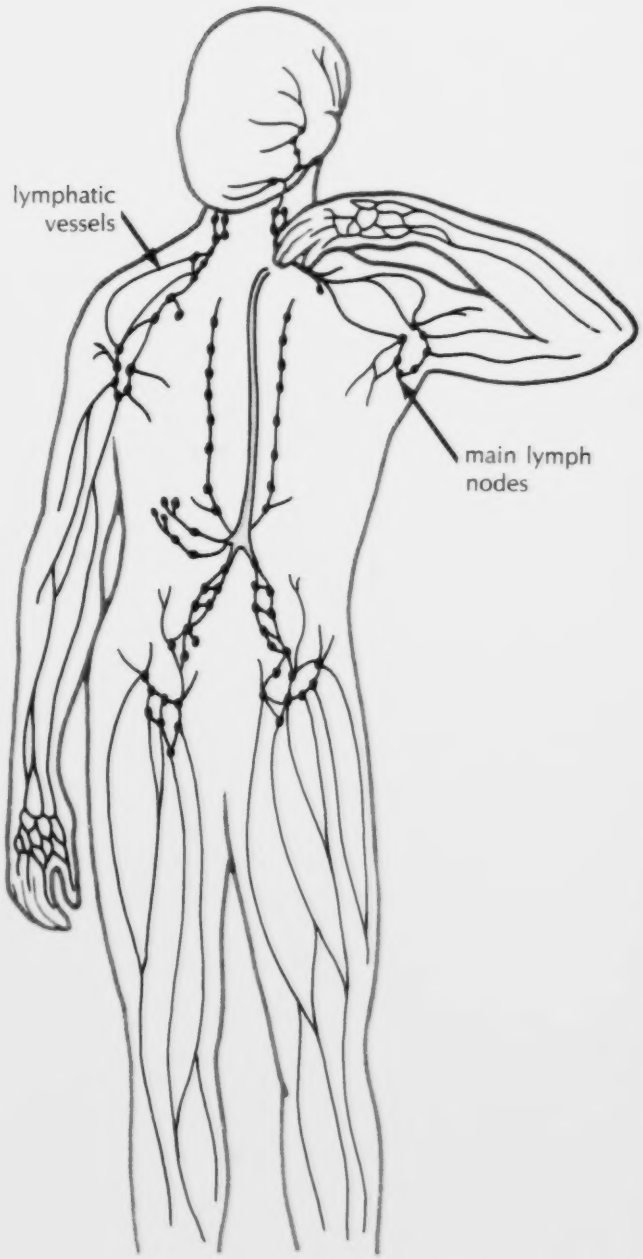
You can sometimes feel your lymph nodes. When you have an infection they sometimes swell up. That's because they are full of the germs and bacteria they have trapped.

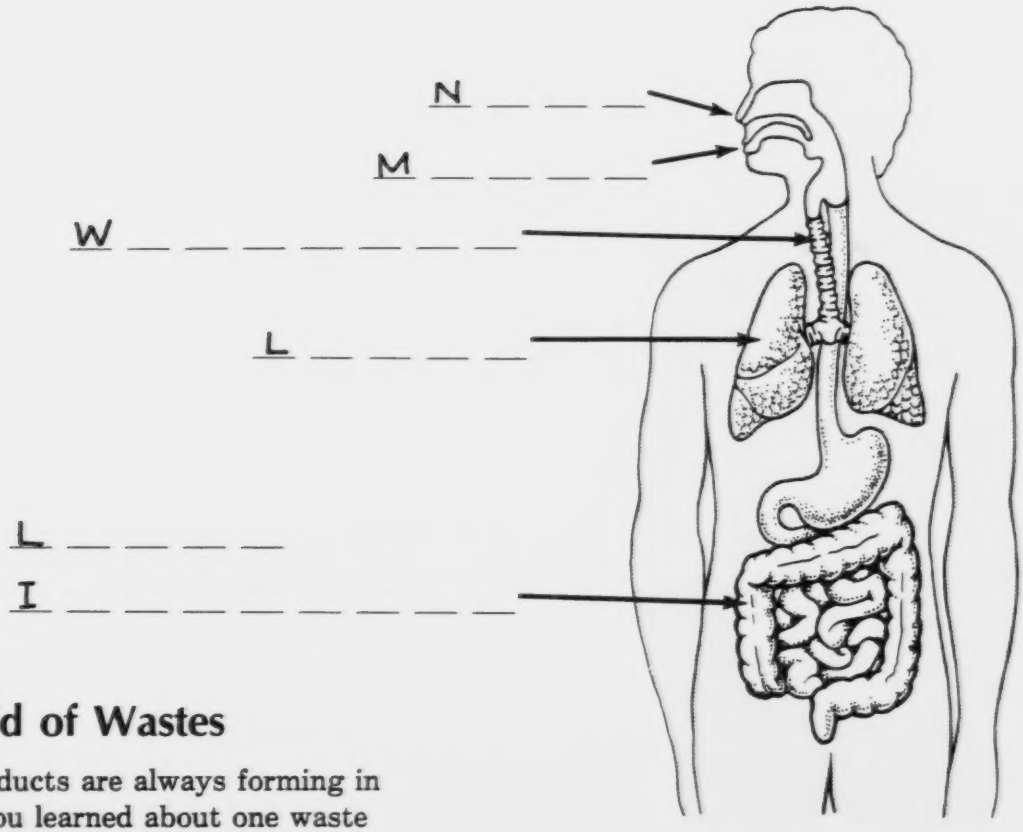
The diagram shows some lymphatic vessels. It also shows the main lymph nodes. On your own body, find the places where those lymph nodes are. What are those places?

_____

_____

_____





Getting Rid of Wastes

Waste products are always forming in your body. You learned about one waste product that goes out when you breathe. What is it?

_____

Did you say *carbon dioxide?*

Carbon dioxide forms in your cells. *Salts, chemicals,* and *water* are also formed in the cells. They are all waste products that form when cells use oxygen and nutrients.

Foods that can't be digested also become waste products. That kind of waste forms in the large intestine of your digestive system.

Your body must get rid of all the waste products that form in it. What do you think would happen if waste products stayed in the body?

_____

_____

Waste products are like poisons. If they stay in your body, the tissues become sick and die.

Several organs and organ systems work together to excrete waste products. Your digestive system excretes the solid wastes that form in your large intestine. Your respiratory system excretes carbon dioxide that the cells make. Your **excretory system** — another organ system — excretes the other waste products that the cells make. (You'll learn more about this system on page 30.)

The diagram on this page shows some organs in the digestive and respiratory systems. Those organs help get waste products out of the body. On the diagram, write the names of those organs.

A Carbon Dioxide Test

Your respiratory system excretes carbon dioxide. You can't see or smell carbon dioxide. But there's a way to show that your body excretes this gas.

You'll need a chemical called *bromothymol blue,* a small jar, and a straw.

1

Pour bromothymol blue into the jar. Fill it one-fourth full.

2

Put a straw in the jar. Gently *blow* into the straw for 30 seconds.

What's Happening?

1. What color is the chemical before you blow into the test tube?

   _____

2. What color is the chemical after you blow into the test tube?

   _____

3. What changes the color of the chemical?

   _____

   Right. The carbon dioxide in the air that you breathe out changes the color.

4. If oxygen is mixed with the chemical, the color will change. What color will the chemical be?

   _____

   Right! It will turn blue again. (Try it!)

Your Excretory System

Carbon dioxide is one waste product that your cells make. What's another waste product? (Look back on page 28 for help.)

Salts, chemicals, and water are the other waste products.

You excrete some of those waste products through your skin. That happens when you sweat. (Notice the salt on your skin after the sweat dries up.)

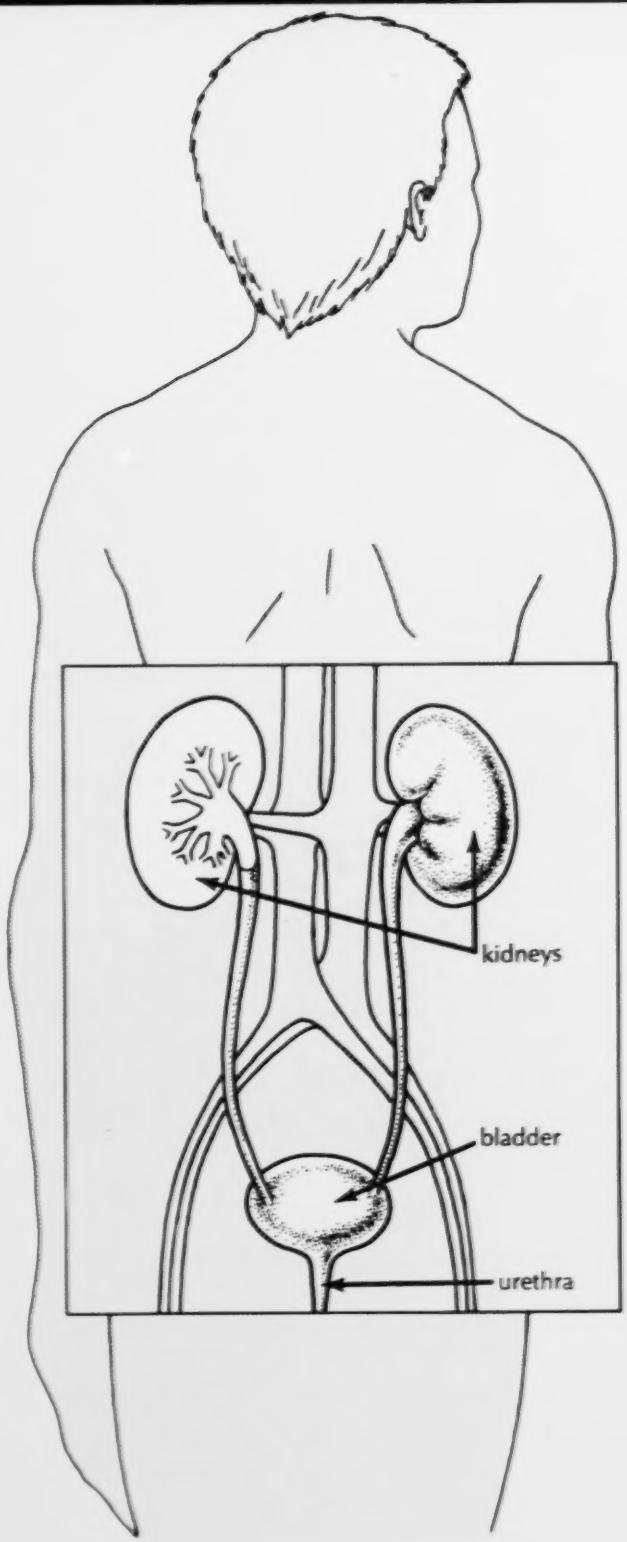
But most of those waste products leave your body through the *excretory system.* Look at the diagram. It shows the main organs in that system. Find the kidneys.

Blood is always flowing through the kidneys. As it flows through, the kidneys take the waste products out of the blood.

The waste products then go into two small tubes. Where do they go next? (Look at the diagram.)

Right, the waste products pass into the *bladder.*

The bladder holds the waste until the body excretes it. Then the waste passes out of the body through another small tube. The waste is called *urine.* What is the small tube called?



Check Yourself

Show what you learned in this unit. Finish these sentences. Draw a line from the words on the left to the correct words on the right.

1. Your circulatory system carries oxygen,
2. Your lymphatic system carries
3. Your digestive system excretes solid
4. Your respiratory system takes out carbon
5. Your excretory system excretes salts,

a. waste products that form in the large intestine.

b. nutrients, and waste products through the body.

c. dioxide that forms in the cells.

d. germs and bacteria to the lymph nodes.

e. chemicals, and water that form in the cells.

Check These Out

1. For your Science Notebook:
   a. *Science Work:*
      - Get an animal heart from a meat shop. Cut the heart in half, and draw what you see.
      - Your heart pumps about five quarts of blood in one minute. How many gallons does it pump in 24 hours? (There are four quarts in a gallon.)
      - White blood cells protect your body from infections. Find out how those cells do that. Make a report to your class.
      - What happens to your body when you have a cold? Find out. Then write a report about it.

   b. *Keep Fit:*
      - How does *aerobic* exercise keep your respiratory and circulatory systems healthy and fit? Find out.
      - Fiber is needed for a good diet. Find out what fiber does. Also find out what foods have fiber.

   c. *In the News:* People can receive a "new" heart. It may be an artificial heart or a heart from another person (a heart transplant). Find an article about someone who received a "new" heart.
2. Your local hospital probably has a *blood drive* every year. Find out what it is. Then visit the next blood drive your hospital holds.
3. Here are more things you may want to find out:
   - What is leukemia? Sickle cell anemia?
   - What does a doctor check for in a physical exam?
   - What are vaccines?
   - What is a cardiac arrest?

Unit 5

Systems That Control Your Body

Your skeletal and muscular systems let your body move. Your respiratory and digestive systems get oxygen and nutrients for your body. Your circulatory, lymphatic, and excretory systems move materials through your body.

All these systems work because of two other organ systems. Those two systems control your body.

- What two organ systems control your body?
- What does each system do?

You'll learn the answers in this unit.

Before You Start

You'll be using the science words below. Find out what they mean. Look them up in the Glossary. On the lines below, write what the words mean.

1. **action** _____

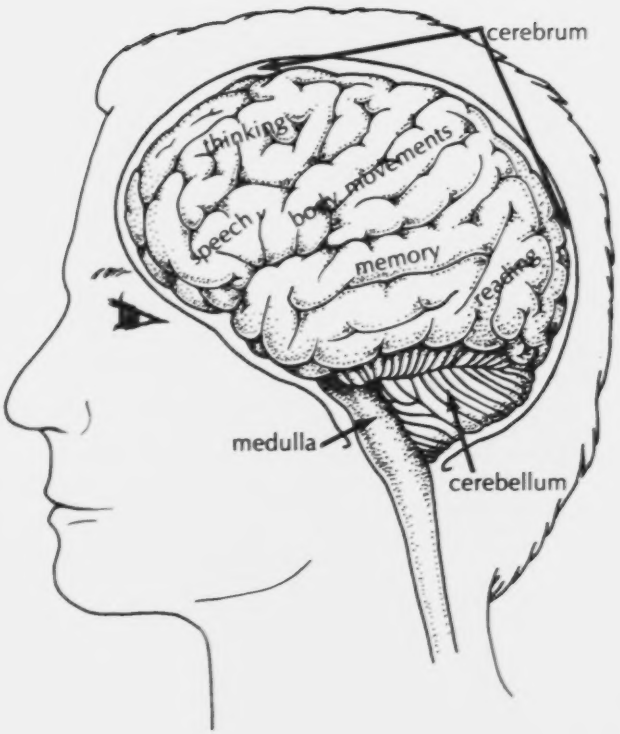
_____

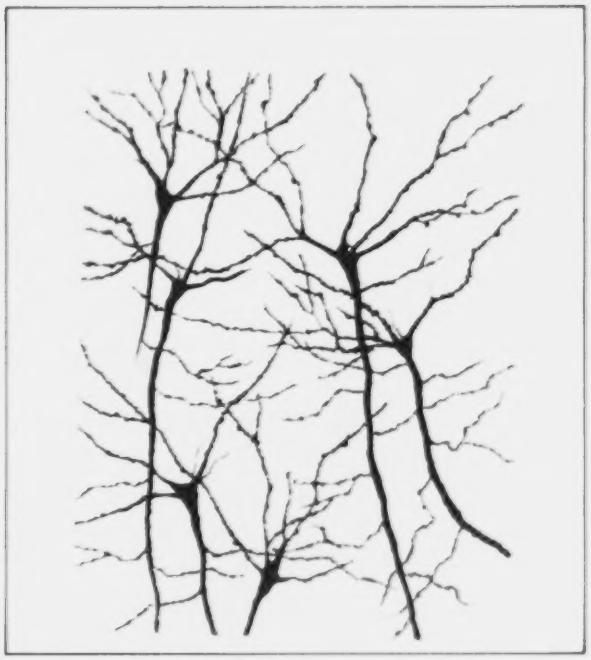
2. **hormone** _____

_____

3. **messages** _____

_____





Brain nerve cells

Your Brain

Think about all the ways your body moves: It bends, stretches, twists, and so on. You have an organ that tells your body how to move. What do you think it is?

That's right! It's your *brain.*

The brain, *nerves,* and *sense organs* make up an organ system that controls every part of your body. That system is your **nervous system.** Here's how that system works:

Your brain sends messages to different parts of your body. The messages travel along special tissues called nerves. Those tissues are made up of nerve cells that are connected to each other. And the nerve cells form a path that goes from the brain to different parts of your body.

The brain is also made up of nerve cells. The picture at the top shows what some brain nerve cells look like. How are they different from your cheek cells? (Look at page 7.)

Different parts of your brain control the different things you do. Look at the diagram of the brain. Find the part of the brain that's called the *cerebrum.*

A part of the cerebrum controls your speech — the way you talk. Another part of the cerebrum controls your body movements. It controls the different parts of your body that move, such as your hands. It tells those body parts when and how to move. What other body parts are controlled by this part of the brain?

Your Sense Organs

You learned that your brain sends messages to every part of your body. Those messages tell the different body parts what to do.

Your brain also receives messages. What kind of messages do you think your brain receives?

_____

_____

Your brain receives facts about the world around you. They tell the brain what things look like, feel like, and so on.

Certain organs get the information the brain needs. Those organs are the *sense organs*. They send messages to the brain. The brain then tells the body parts what to do. Your brain and sense organs are always sending messages back and forth. And it all happens in a matter of seconds!

Several sense organs in your body gather information about the world. Your main sense organs are your nose, ears, eyes, tongue, and skin.

Each of those sense organs gathers certain information. For instance, your nose gathers facts about the way things smell.

Five sense organs are listed below. Next to each organ, write what kind of information it gathers. The first one is done for you.

Nose smell

Eyes _____

Ears _____

Tongue _____

Skin _____

Kinds of Action

Your brain controls every action in your body. Some actions, such as sitting or reading, are *voluntary* actions. That means you do them because you want to. When you want to sit, this happens: Your brain tells muscles in your body to move certain parts so you can sit.

Other actions, such as your blood moving through your body and your eyes blinking, are *involuntary*. That means your body does them automatically. You don't have to think about doing them.

Some actions that you do are listed below. Which ones are voluntary? Which ones are involuntary?

Write **V** for those actions that are voluntary. Write **I** for those actions that are involuntary. Then check your answers. (The right answers are upside down.) The first two are done.

V 1. Walking

I 2. Breathing

____ 3. Eating

____ 4. Talking

____ 5. Heart beating

____ 6. Throwing a ball

____ 7. Sweating

Look at the picture. What voluntary actions is that person doing?

_____

_____

_____

What involuntary actions do you think that person's body is doing?

_____

_____

_____

Answers

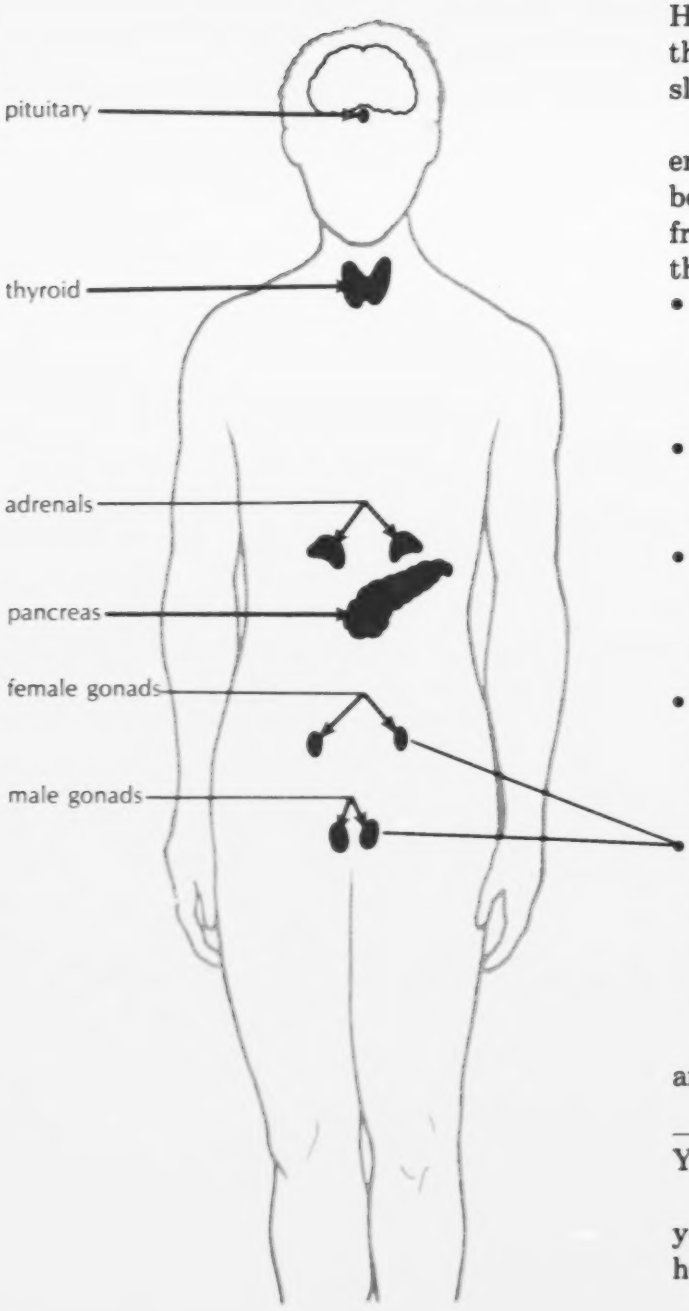
1. V 2. I 3. V 4. V
5. I 6. V 7. I

Your Endocrine System

Another organ system also controls your body. That system is your **endocrine system.**

The endocrine system is made up of *endocrine glands.* Those glands are scattered throughout your body. They make certain chemicals called *hormones.* Hormones make your cells do certain things, such as use nutrients quickly or slowly.

The diagram shows some important endocrine glands. Read the sentences below about each gland. Then draw a line from the sentences to the right gland on the diagram. (One is done.)

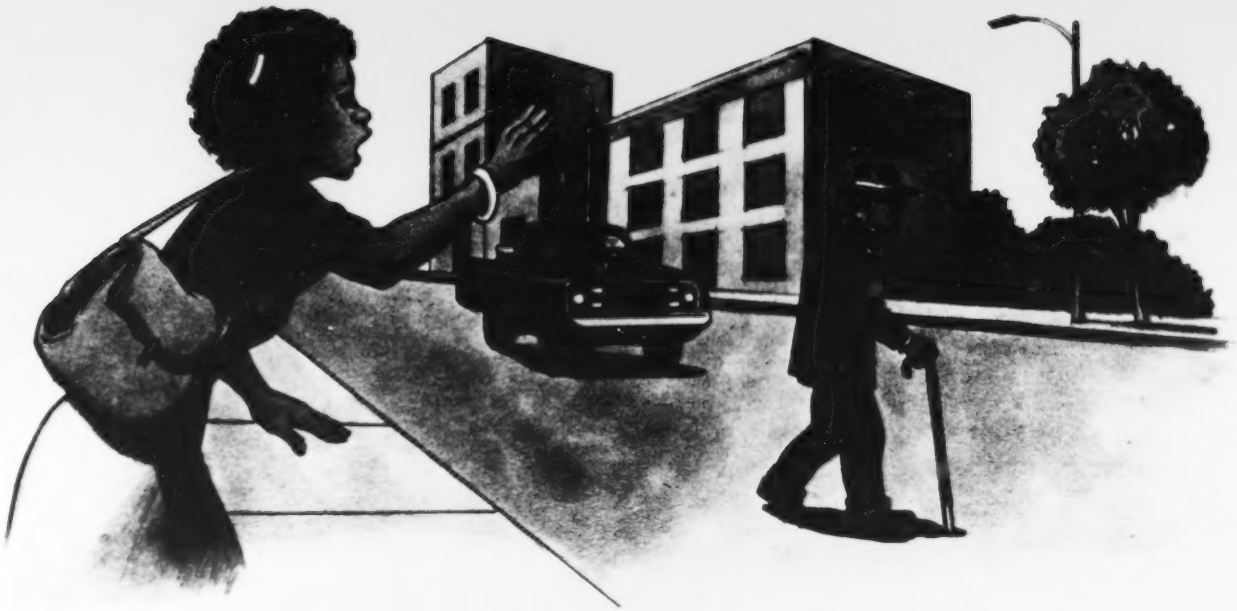


- The *pituitary gland* is behind the middle of the forehead. That gland makes hormones that control many of the other endocrine glands.
- The *thyroid gland* is in the neck. It makes hormones that control how cells change nutrients into energy.
- The *adrenal glands* are above the kidneys. They make *adrenaline.* Adrenaline gives you quick strength and energy.
- Part of the *pancreas* is an endocrine gland. It makes a hormone that controls how much sugar is turned into energy.
- The *gonads* control the organ system that makes new humans. They also control the changes that males and females go through during their teenage years.

The hormones are carried to cells by another organ system. What is it?

Yes; your circulatory system.

The hormones from the glands go into your blood. Your blood then carries the hormones to the cells.



Glands in Action

What do your endocrine glands do? Answer these questions. Then check yourself. (The right answers are upside down.)

1. Suppose you're 16 years old. Your body is changing. Your voice is changing. Hair is growing on your body. What endocrine glands are at work?

   _____

2. You're walking home. You see a friend about to cross the street. You notice a speeding car coming right at your friend. You run as fast as you can to save him. What glands send hormones into your body so you can run fast?

   _____

3. You're tired. You eat an orange, and you have energy again. The sugar in the orange gives your cells energy. One of your endocrine glands causes that to happen. What gland is it?

   _____

4. The food you ate for breakfast is digested. The nutrients are in your bloodstream. A gland sends out hormones that tell your cells to change the nutrients into energy. What gland is it?

   _____

5. Your different endocrine glands are always making hormones. They do that because one gland controls them. What gland is it?

   _____

Answers

1. Gonads or pituitary
2. Adrenal glands 3. Pancreas
4. Thyroid 5. Pituitary

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Check Yourself

Show what you learned. Answer these questions. The page number after each question tells where you can find the answer.

1. What system controls everything your body does? (page 33)

   N ___ ___ ___ ___ ___ ___ system

2. What organs gather information about the world around you? (page 34)

   S ___ ___ ___ ___ o ___ ___ ___ ___ ___

3. What part of your body controls every action that your body does? (page 35)

   B ___ ___ ___ ___

4. What system is made up of glands scattered throughout your body? (page 36)

   E ___ ___ ___ ___ ___ ___ ___ ___ system

5. What chemicals make your cells do certain things? (page 36)

   H ___ ___ ___ ___ ___ ___ s

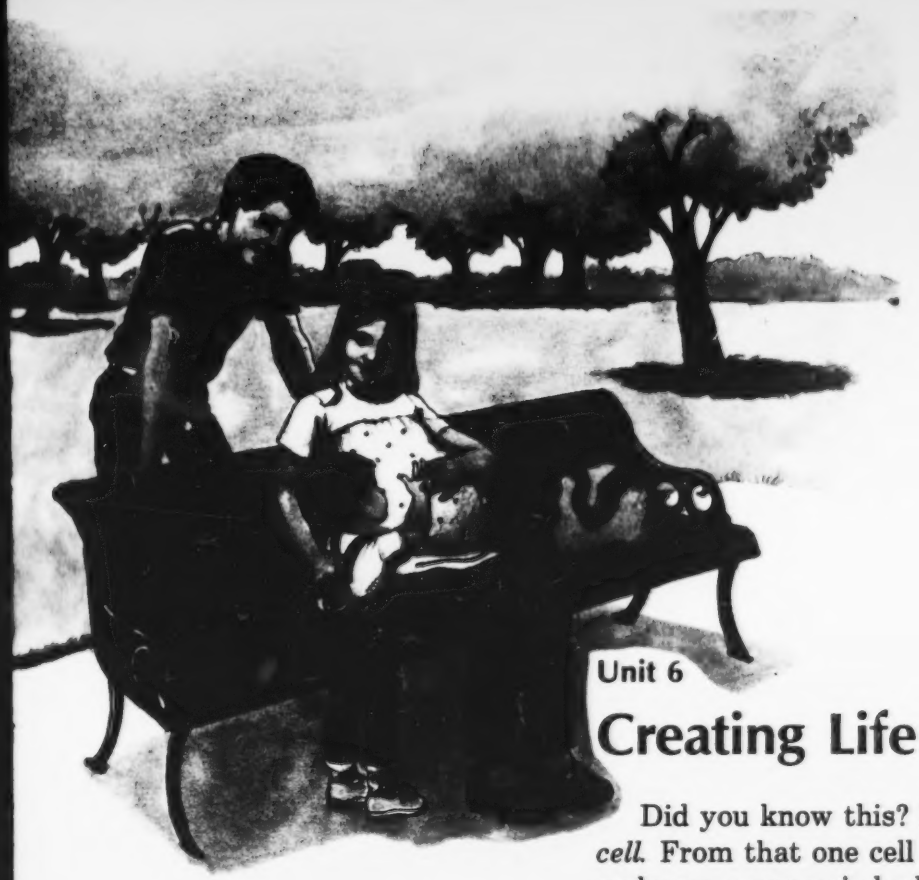
Check These Out

1. For your Science Notebook:
   a. *Science Work*:
      - Get a prepared slide of nerve cells. Look at it in your microscope. Draw what you see.
      - Get a cow's eye from a meat shop. Carefully cut it in half. Find these parts: the *retina*, *lens*, and *cornea*. Draw the eye and label those parts. If you need help, use a picture from a book, such as an encyclopedia.

   b. *Keep Fit*: Find out what *stress* is. Find out different ways a person can handle stress.

   c. *In the News*:
      - Drugs are chemicals that can help or harm the body. Find an article that talks about what drugs can do to the body.
      - The brain has a left side and a right side. Find an article that talks about the sides of the brain.

2. Make a big poster of the brain. Label the cerebellum, cerebrum, and medulla.
3. Sometimes endocrine glands don't make enough hormones. Pick one endocrine gland. Find out what happens when it doesn't make enough hormones.
4. Here are more things you may want to find out:
   - What are other endocrine glands? What does each gland control?
   - How does each sense organ work?
   - What is the nervous system like in the earthworm, dog, and whale?



Unit 6

Creating Life

Did you know this? Everyone begins life as *one cell.* From that one cell come the billions of cells that make up a person's body.

Males and females have organ systems that can start a new person — and a new life. If they didn't have those systems, the human race would die out. There would be no people in the world.

- What organ system starts life?
- When is a new life started?
- How does one cell turn into billions of cells?

You'll learn the answers in this unit.

Before You Start

You'll be using the science words below. Find out what they mean. Look them up in the Glossary. On the lines below, write what the words mean.

1. **fertilize** _____

_____

2. **fetus** _____

_____

3. **reproduce** _____

_____

Starting from One Cell

All living things have a way to *reproduce* themselves. What do you think would happen if living things couldn't reproduce?

_____

_____

The human body has an organ system to reproduce humans. We call that system the **reproductive system.**

A baby is born with all the parts of his or her reproductive system. But that system doesn't start working until a person is around 12 years old. At that time, another organ system starts sending hormones to the reproductive system. What system sends the hormones?

_____

Right! The endocrine system sends hormones to the reproductive system.

The hormones tell the reproductive system to start producing *sex cells.* In the female, those sex cells are called *eggs.* In the male, they are called *sperm.*

Those two kinds of sex cells cannot create a new life by themselves. To do that, they must join together and become one cell. When that happens, we say the sperm *fertilizes* the egg.

The picture shows an egg cell that has been fertilized by a sperm cell. How does that one cell become many cells?

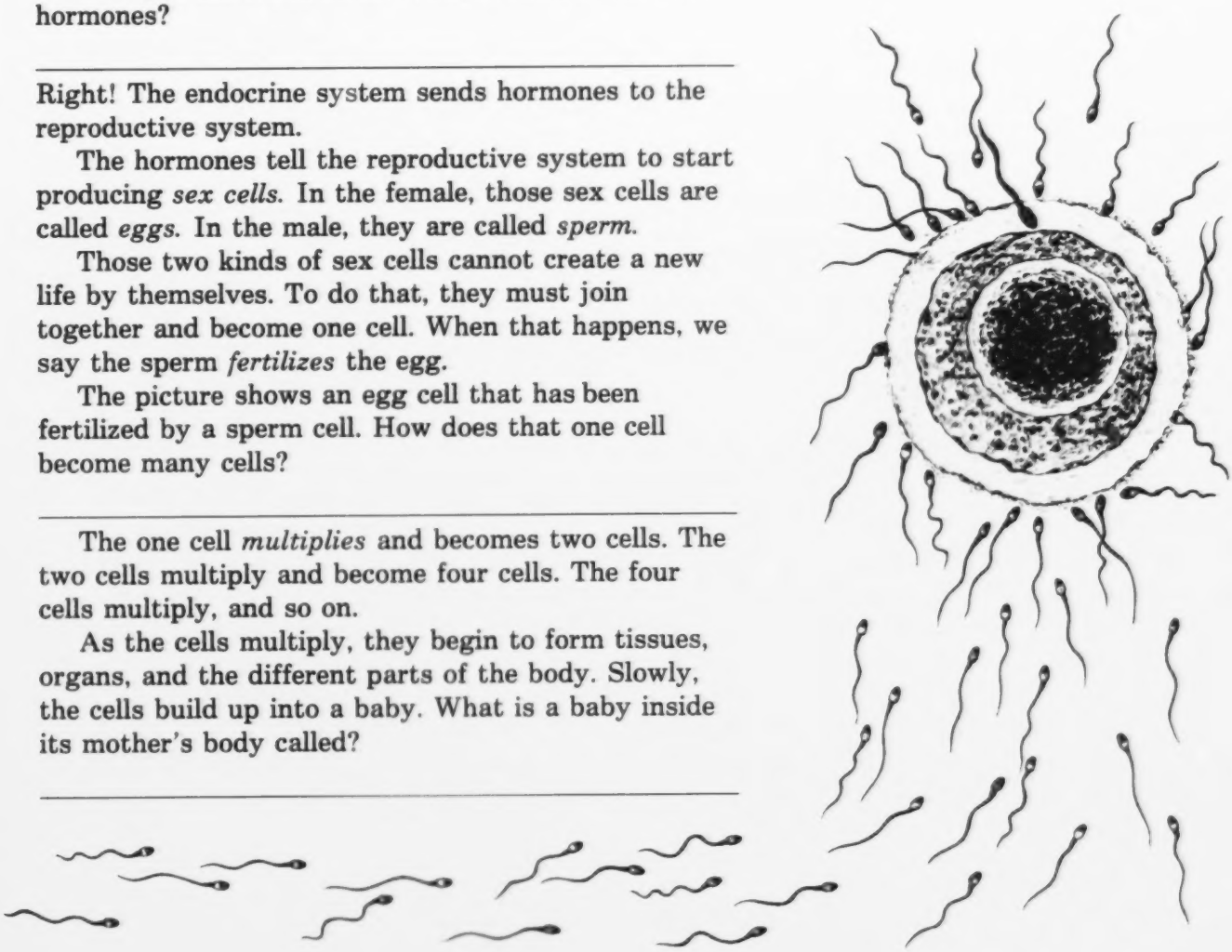
_____

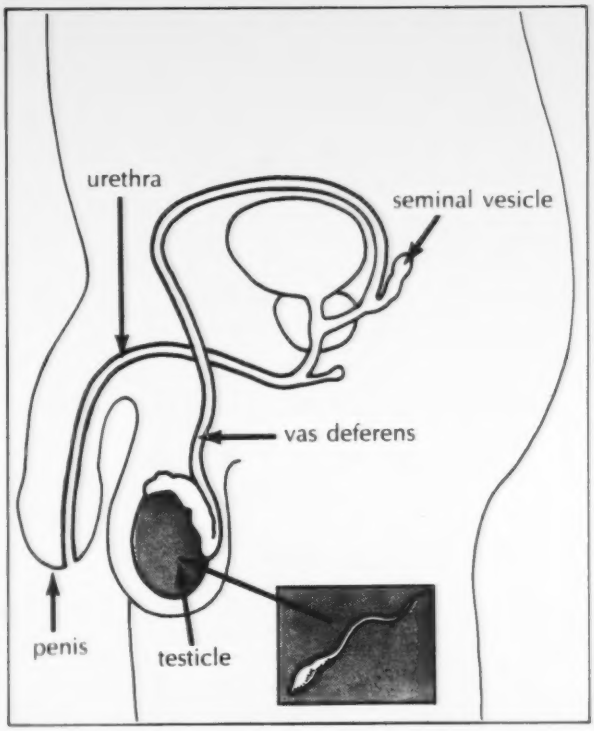
The one cell *multiplies* and becomes two cells. The two cells multiply and become four cells. The four cells multiply, and so on.

As the cells multiply, they begin to form tissues, organs, and the different parts of the body. Slowly, the cells build up into a baby. What is a baby inside its mother's body called?

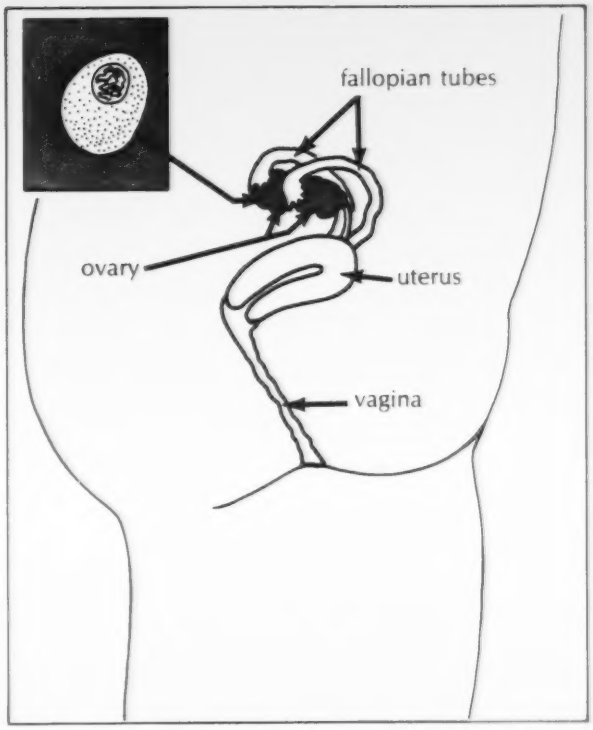
_____

Many sperm cells come from the male's reproductive system. But only one sperm cell will fertilize the egg cell.





Male



Female

The Reproductive Organs

The reproductive organs in a male and female are different. That's because they must do different things in order to produce a new human.

Look at the diagram of the male reproductive organs. What organ do you think makes the sperm cells?

_____

The *testicle* makes the sperm cells. (The male body has two testicles.) Those sperm cells move through tubes called *vas deferens.* They go to the *seminal vesicle.* The sperm cells are stored there until they are ready to be released. Then they are pushed out of the body through the *urethra.* That is a tube in the *penis.*

Now look at the diagram of the female reproductive organs. What organ do you think produces egg cells?

_____

The *ovary* produces egg cells. (The female body has two ovaries.)

The egg cell moves through a *fallopian tube.* If the egg cell joins a sperm cell along the way, it becomes fertilized. Then it attaches itself to the wall of the *uterus.* It slowly develops into a *fetus.*

When the fetus is ready to be born, we call it a *baby.* The muscles of the uterus push the baby out. The baby leaves through the *vagina.*

A cell takes several months to develop into a baby that's ready to be born. How long do you think it takes?

_____ months

Nine Months

What day were you born?

_____

That day was your first day of life in the outside world! Before that day you were developing inside your mother's uterus. You probably lived there for nine months. That's usually how long a human fetus lives inside its mother.

You learned that a person begins life as *one cell.* The cell multiplies and attaches itself to the wall of the uterus. At that stage, we call it an **embryo.** An embryo doesn't look like a human baby. What do you think it looks like?

_____

The pictures on this page show how an embryo develops into a fetus. Look at picture **A.** It shows an embryo. The embryo is one month old. The heart has formed and is beating. (At this stage, the heart looks like a tube.) The brain and skeleton are just forming.

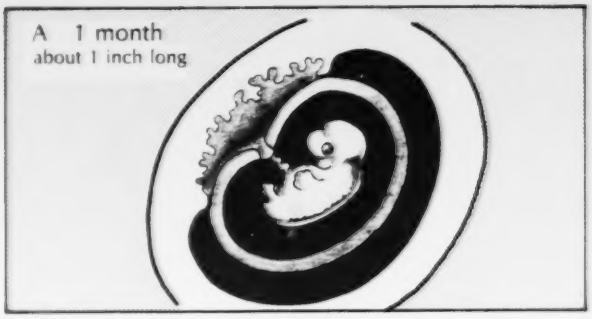
In picture **B,** the new life has grown twice its size. It is three months old. It now looks like a human baby. Now we call it a fetus. It has nerves, lungs, a stomach, intestines, a bladder, and muscles. But only the muscles are working. They let the fetus move in the uterus.

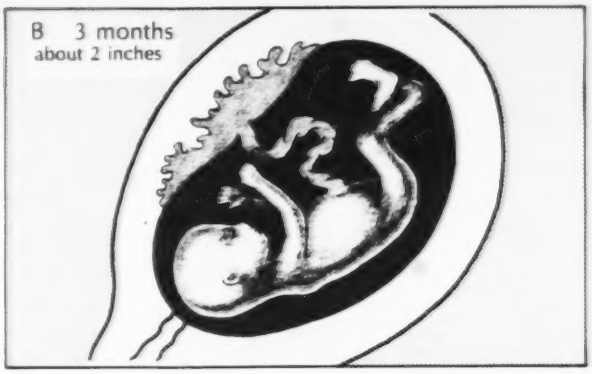
In picture **C,** the fetus is six months old. Its respiratory, circulatory, and digestive systems are almost completely formed. It moves around a lot. It kicks, turns, and swings its arms.

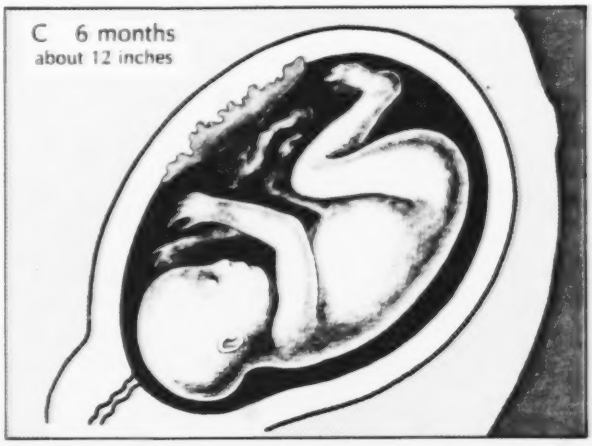
Picture **D** shows the fetus when it's nine months old. What do you think: Is the fetus ready to be born? Why?

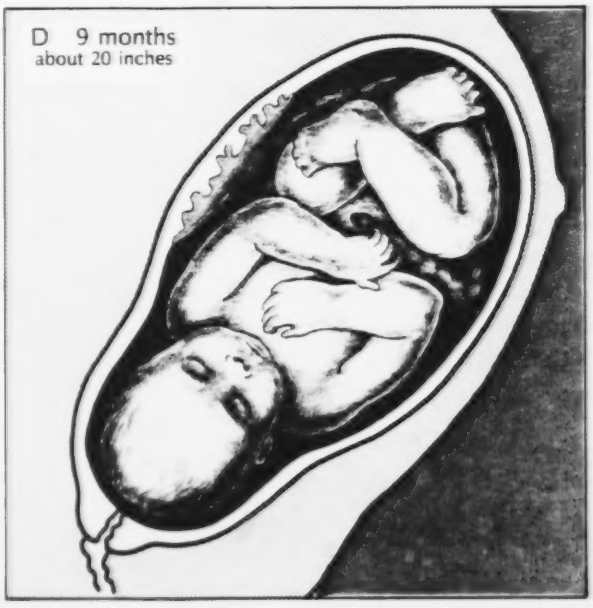
_____

_____









Check Yourself

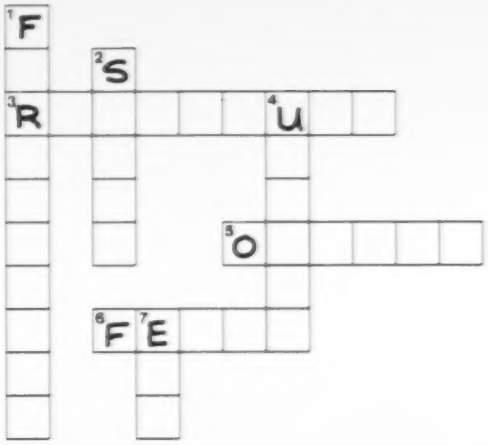
Use words from this unit to do the crossword puzzle. The clues below will help you. In the puzzle, each word is started for you. Check your spelling by looking at the page after each clue.

Across

3. To create a new living thing. (page 40)
5. The reproductive _____ are different in men and women. (page 41)
6. What an unborn baby is called. (page 41)

Down

1. A new life is created when an egg is _____ . (page 40)
2. The male sex cell. (page 40)
4. Where the fetus grows. (page 41)
7. The female sex cell. (page 40)



Check These Out

1. For your Science Notebook:
   a. *Science Work:* Get a chicken egg. Carefully break open its shell. Look at the egg and its shell. Find these parts: the membrane, the albumen (white), and the part that holds the nutrients (yolk). Draw the egg and label its parts.
   b. *Keep Fit:*
      - A pregnant woman should eat certain foods to have a healthy baby. Find out what foods she should eat.
      - Doctors tell pregnant women not to smoke, drink alcohol, or take most kinds of drugs and medicines. Find out why.
      - How big is the fetus at 1 month? 3 months? 6 months? 9 months?
   c. *In the News:* Sometimes a woman gives birth to twins or triplets. They are called multiple births. Find an article about a multiple birth.
2. Make a "Baby Board." Have each student in class bring a picture of himself or herself as a baby. Then put up the pictures on a bulletin board.
3. As a class, talk about the responsibilities a woman and a man might have as parents.
4. Here are more things to find out:
   - What is the amnion? The placenta? The umbilical cord?
   - What is heredity?
   - How does a baby get Down's syndrome? Mental retardation?

Unit 7

Taking Care

Eat Right!

You've learned about several of your organ systems. In order for your systems to work right, you must take care of them. What can you do to take good care of your systems?

One thing you can do is this: Eat foods that give your cells the nutrients, vitamins, and minerals they need. Here are some of them:

- Protein is a nutrient. It lets your cells grow and repair themselves. Protein is in foods such as hamburger, cheese, beans, and tofu. What are some other foods that can give you protein?

_____

_____

- Carbohydrate is another nutrient. It gives your cells fuel. Foods such as rice, tomatoes, and apples have carbohydrate. What are other foods?

_____

_____

- Your body needs many different vitamins. Vitamin C is just one of them. Fresh fruits and vegetables are rich in vitamin C. What foods can you eat to get vitamin C?

_____

_____

- Calcium is a mineral everyone needs. It keeps the skeleton strong. Milk and ice cream are two foods rich in calcium. What are some other foods?

_____

_____

These are only a few of the nutrients, vitamins, and minerals your body needs. There are many more. If your body doesn't get enough of any of them, you can get sick. What are the other things your body needs? What foods give you those things? Find out!

Watch Out!

Sometimes people eat, drink, and breathe things that can damage their body. They smoke too many cigarettes. They drink too much alcohol. Or they abuse drugs such as marijuana, cocaine, and heroin.

Cigarettes, alcohol, and drugs contain strong chemicals. Those chemicals can harm the body in many ways. Here are some ways:

Cigarettes contain a chemical called *nicotine.* (Nicotine is often put in sprays that are used to kill bugs.) Find out how nicotine can damage the respiratory system. Write your information here:

When people drink too much alcohol, they can damage their liver. Find the answers to these questions:

What is the liver's job in the human body?

What happens when alcohol damages the liver?

Some drugs are very harmful. Many scientists now think that some drugs can destroy certain nerve cells in the brain. They think that marijuana, LSD, and PCP (angel dust) can destroy the nerve cells that help a person think. How could that be bad for a person?

Show What You Learned

What's the Answer?

Write the correct name of the organ system.

skeletal	**lymphatic**
muscular	**excretory**
respiratory	**nervous**
digestive	**endocrine**
circulatory	**reproductive**

1. Moves oxygen, nutrients, and waste products through the body.

   _____

2. Controls how the body acts.

   _____

3. Moves oxygen and carbon dioxide in and out of the body.

   _____

4. Breaks down food into nutrients.

   _____

5. Can create another life.

   _____

6. Moves body parts.

   _____

7. Traps and kills germs and bacteria.

   _____

8. Controls the body with hormones.

   _____

9. Gives your body support.

   _____

10. Removes liquid waste.

    _____

What's the Word?

Write the correct words for the meanings.

1. Parts of food the cells use

   N _____

2. A chemical that tells the body to act a certain way

   H _____

3. The smallest living thing

   C _____

4. The way the bones are put together to support the body

   S _____

5. An unborn baby

   F _____

6. The gas the body needs to live

   O _____

Congratulations!

You've learned a lot about your human body. You've learned:

- what ten organ systems are;
- what each organ system does;
- what things keep your body alive and healthy; and
- many other science facts about the organ systems.

Glossary

ac tion A movement by any body part.

cell The smallest living part of the body.

cir cu la to ry sys tem The organs that move blood through the body.

con tract To get shorter; to squeeze.

di gest To break food down.

di ges tive sys tem The organs that break food down.

em bry o A living thing that's starting to develop its body parts.

en do crine sys tem The organs that make chemicals that control the body.

en zyme A chemical that helps break food down.

ex crete To get rid of.

ex cre to ry sys tem The organs that remove cell wastes from the body.

fer til ize To join a sperm cell with an egg cell.

fe tus An unborn baby that's in its mother's body.

hor mone A chemical that makes cells do certain things.

joint The place where two bones meet.

lymph A fluid that carries waste from the cells.

lym phat ic sys tem The organs that move lymph through the body.

mes sa ges The facts sent back and forth between the brain and the body.

mul ti ply To grow. Cells multiply into more cells.

mus cu lar sys tem The organs that move different body parts.

ner vous sys tem The organs that control what the body does.

nu tri ents The parts of food that cells use.

or gan A body part that is made up of different tissues.

ox y gen A gas that cells need to live.

re lax To get longer.

re pro duce To make a new living thing.

re pro duc tive sys tem The organs that make new living things.

res pi ra to ry sys tem The organs that move air and other gases in and out of the body.

skel e tal sys tem The organs that give your body shape and support; the body's bones.

skel e ton All the bones inside your body.

tis sue A group of the same kind of cells.

waste prod ucts Materials that your body makes when it uses food and oxygen.

JB James Books Publishers
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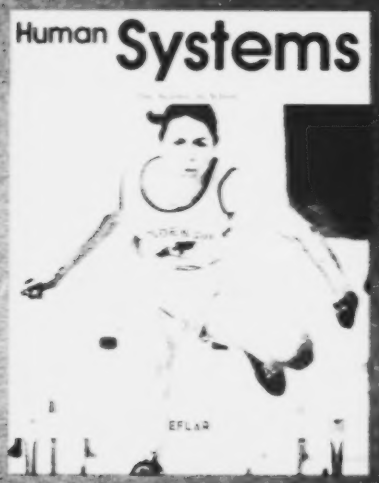

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